

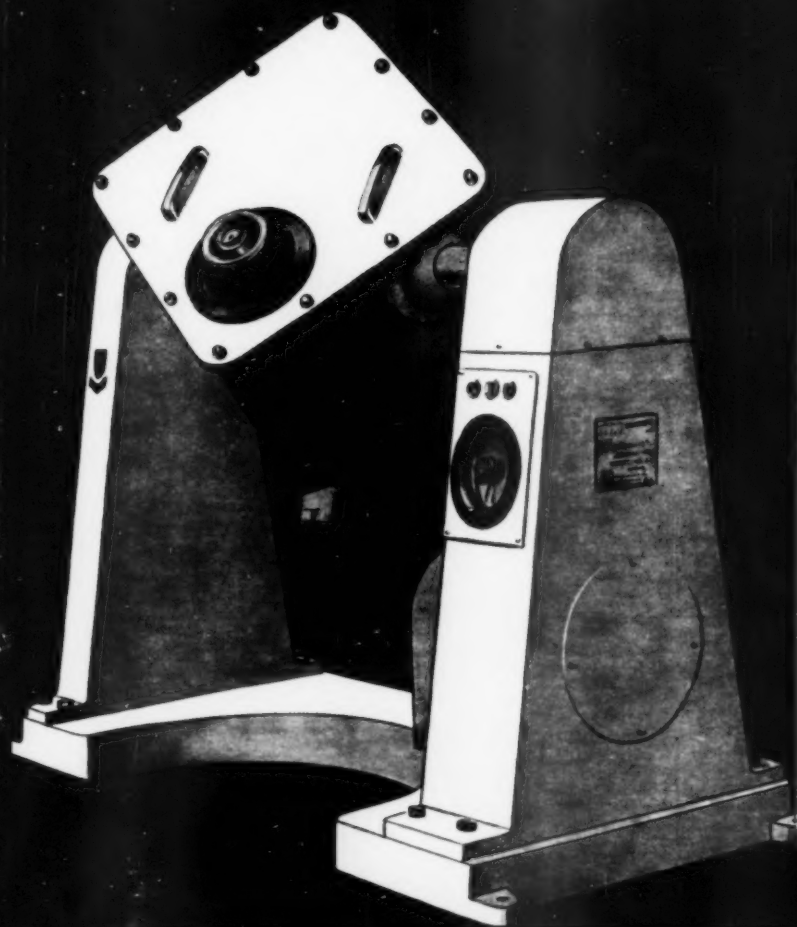
Manufacturing Chemist

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Vol. XXXII No. 9

SEPTEMBER 1961



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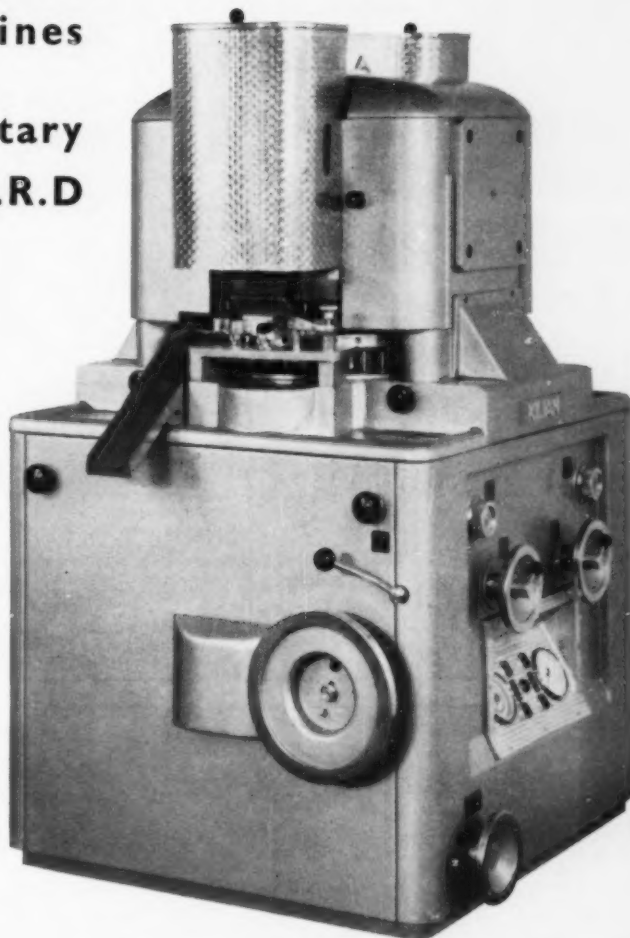
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Stations	33	39
Hourly output infinitely variable	50,000-145,000 tablets	60,000-170,000 tablets
Tablet diameter	2-22 mm.	2-16 mm.
Depth of filling	{ 0-15 mm. 0-20 mm.	{ 0-15 mm. 0-20 mm.
Pressure maximum	10 tons	10 tons
Motor	5.4 h.p.	5.4 h.p.
Height of machine	1,600 mm.	1,600 mm.
Base	950×950 mm.	950×950 mm.
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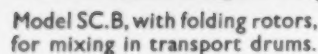
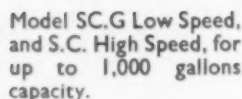
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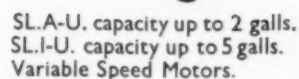
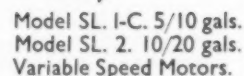


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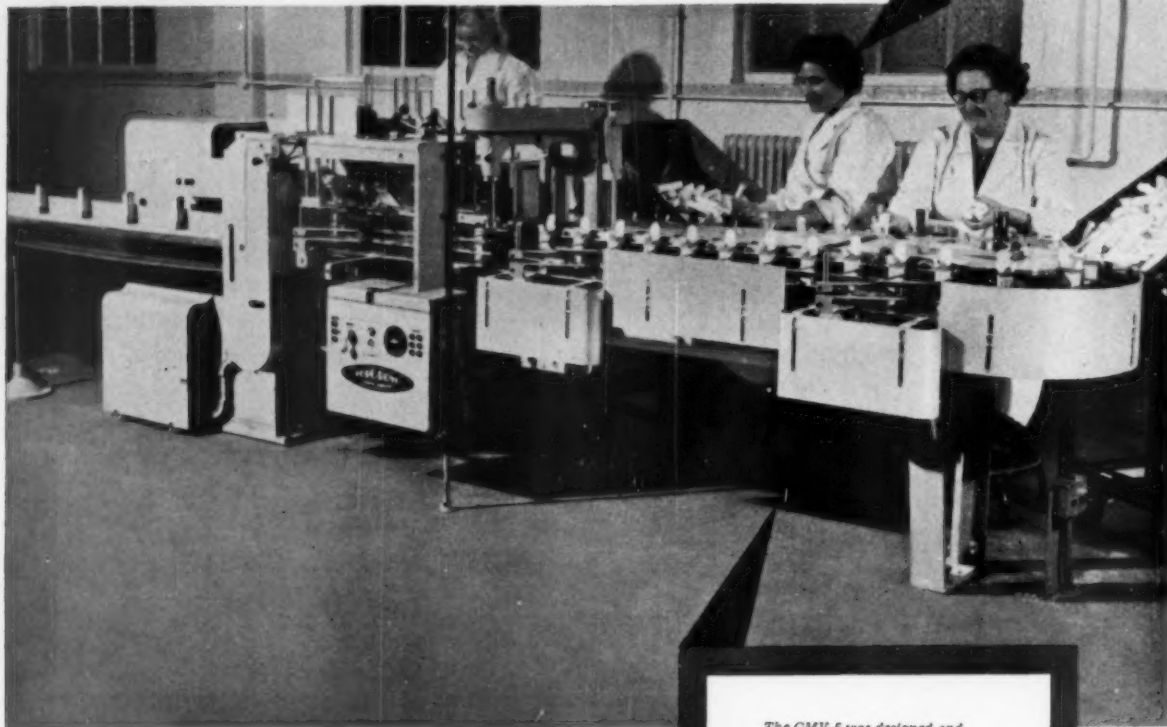
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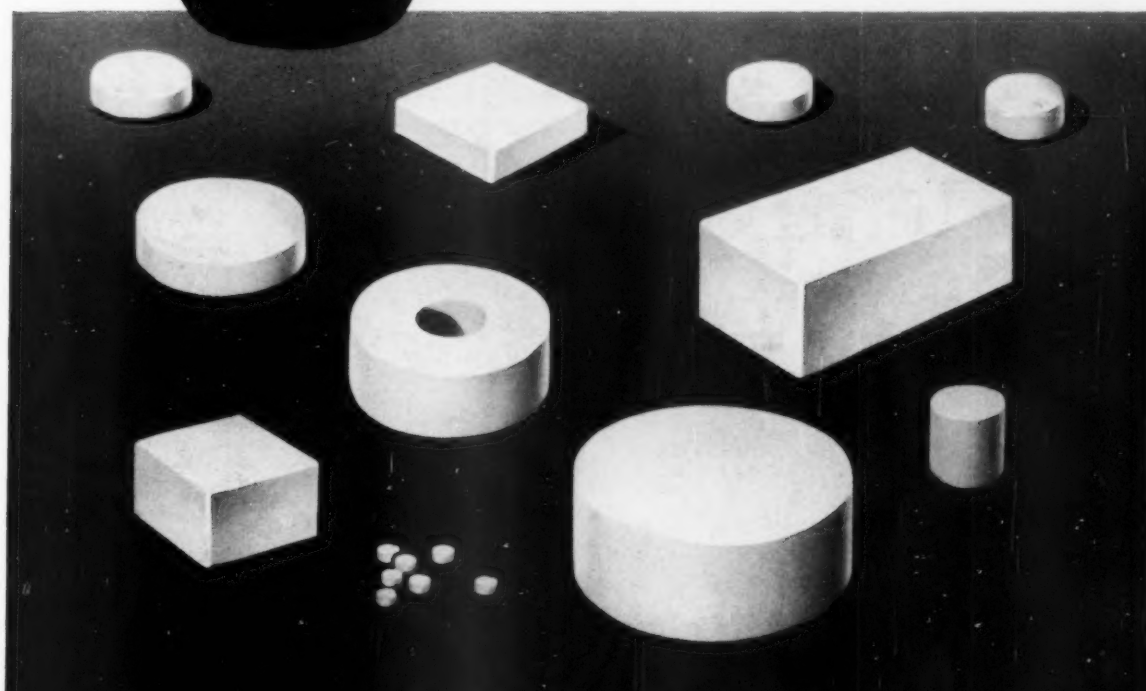
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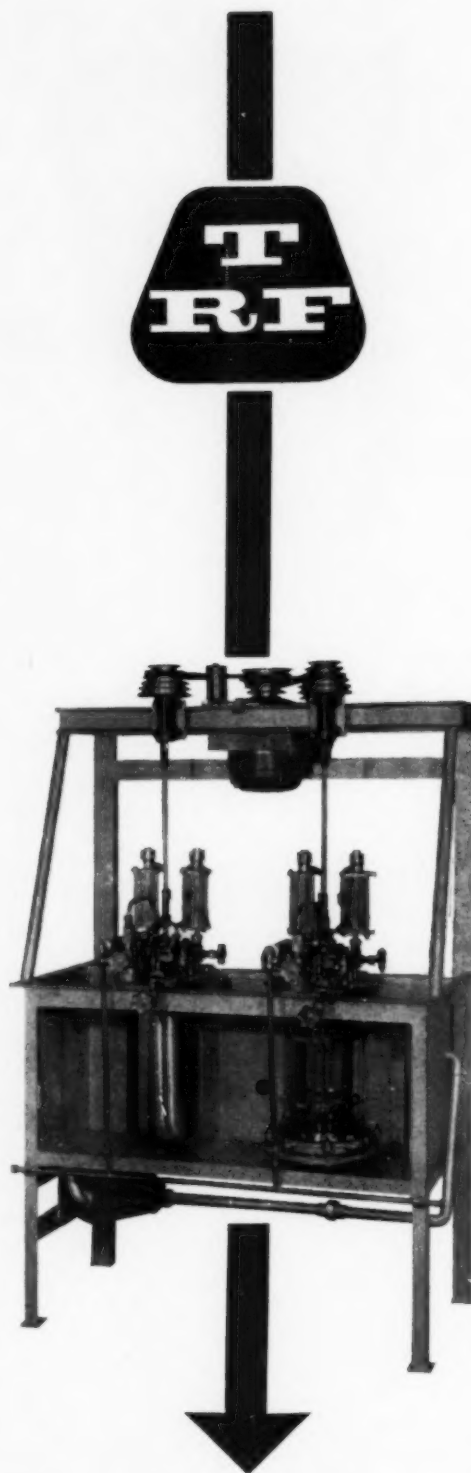
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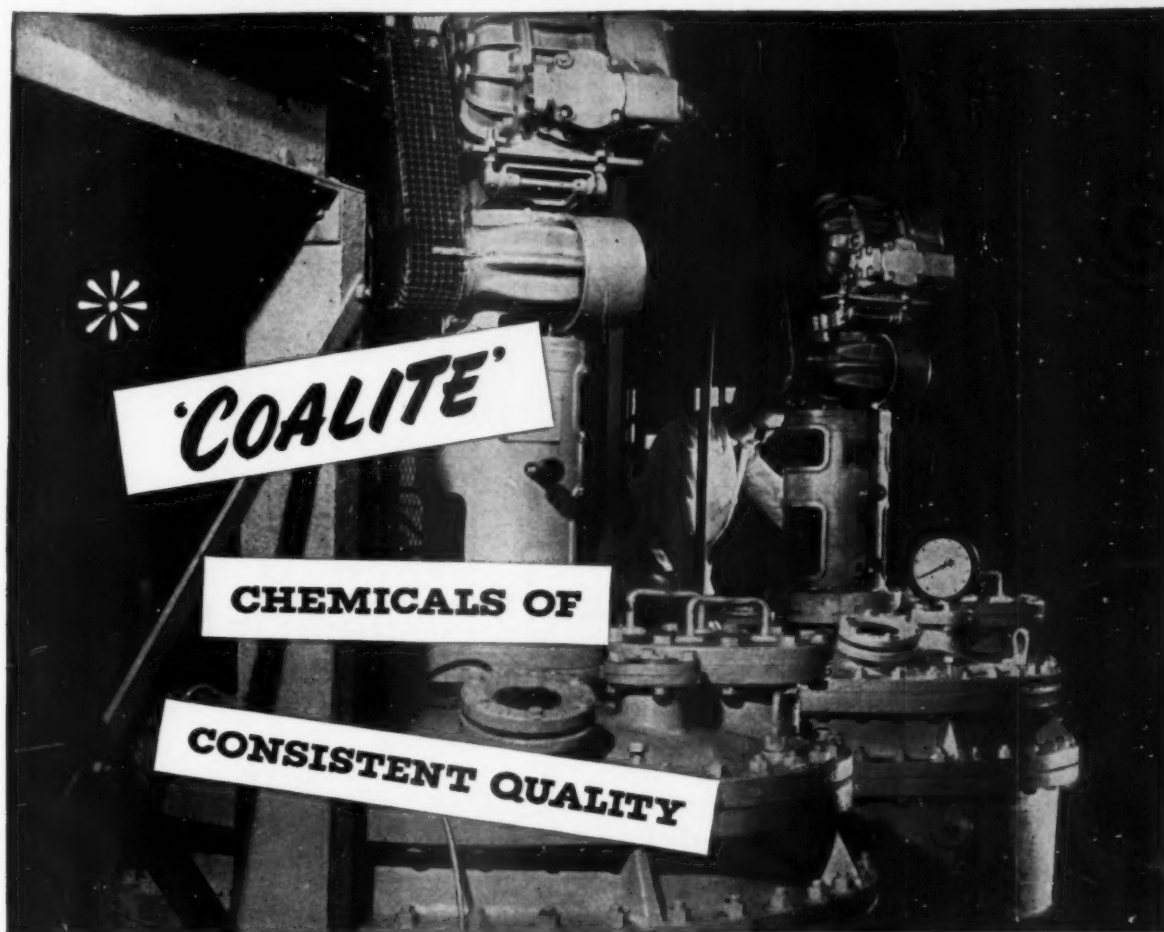
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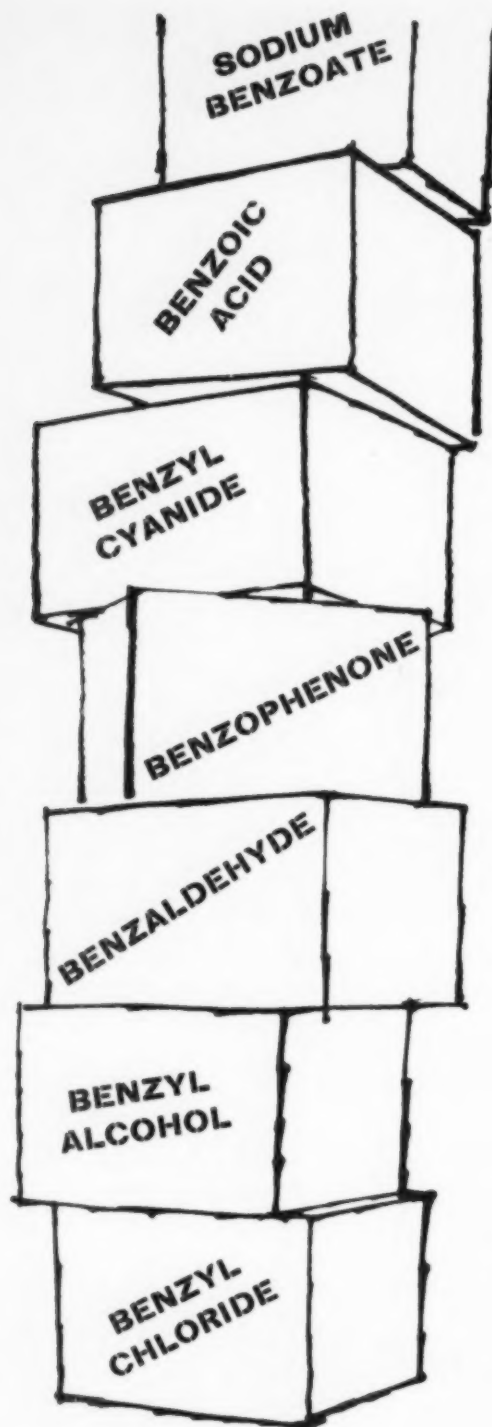
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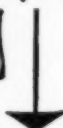
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FORGET THE
BUTTER THE BUTTER
THE BUTTER THE BUTTER

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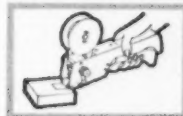
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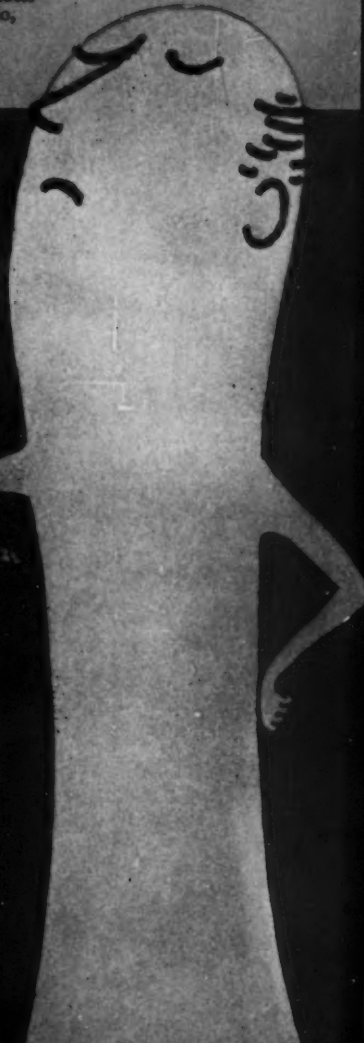


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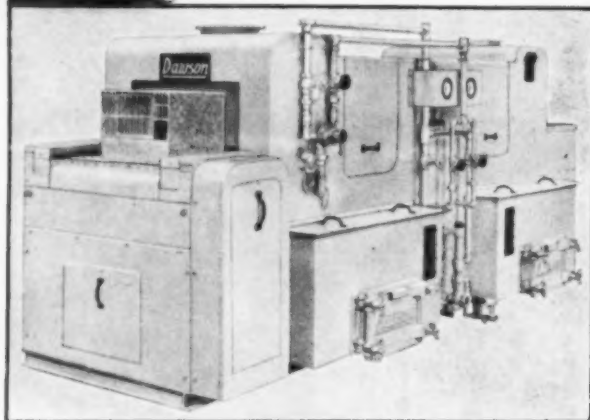
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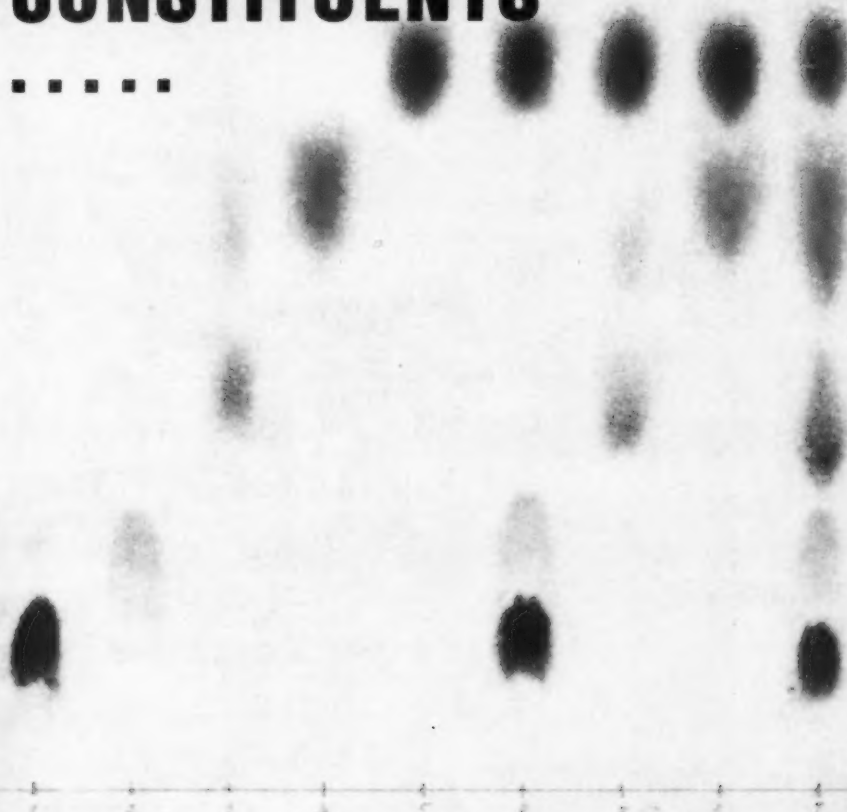
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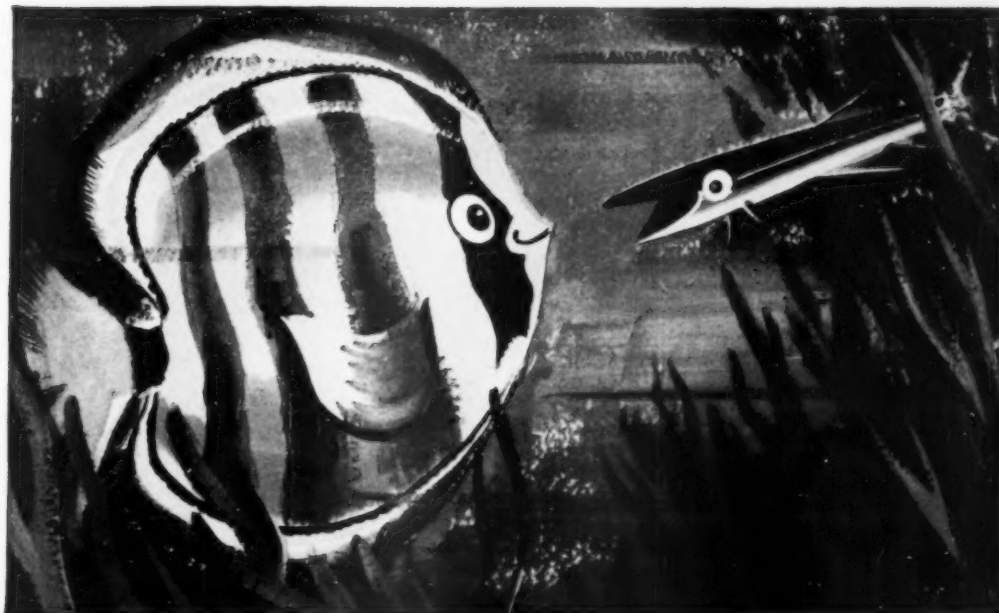
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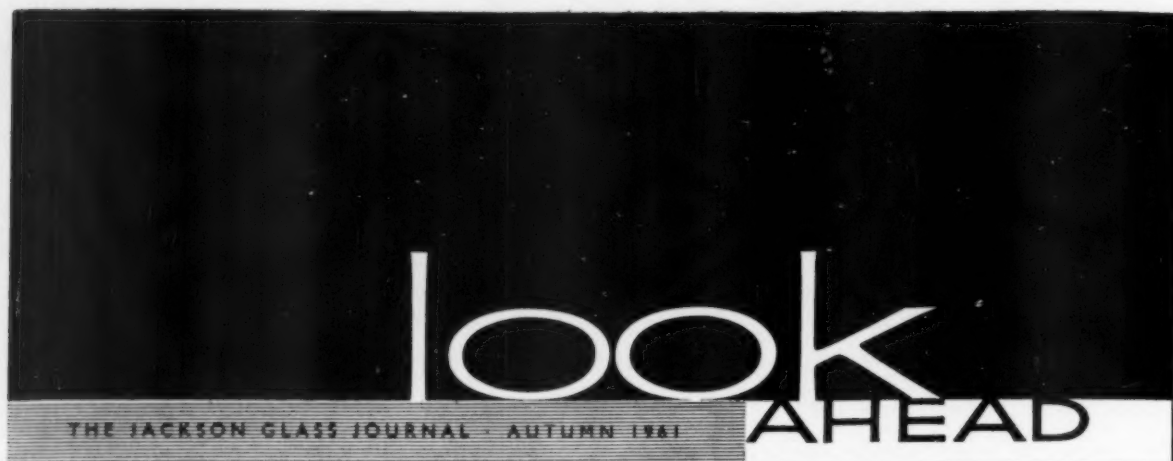
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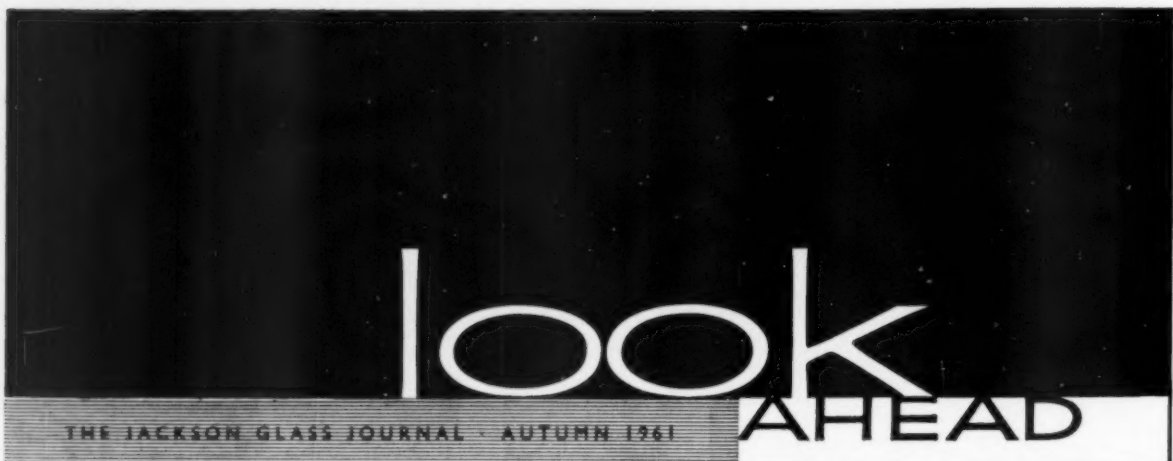
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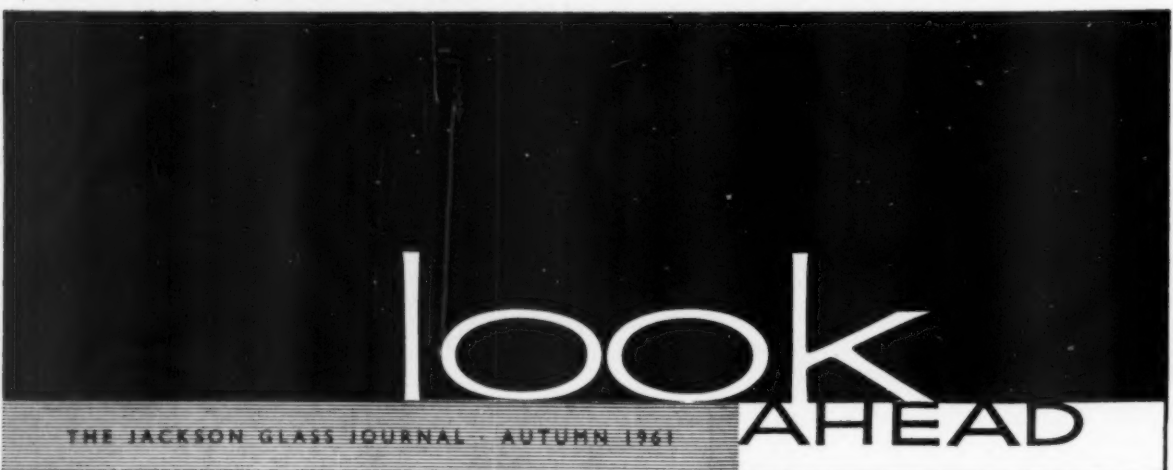




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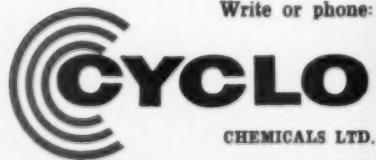
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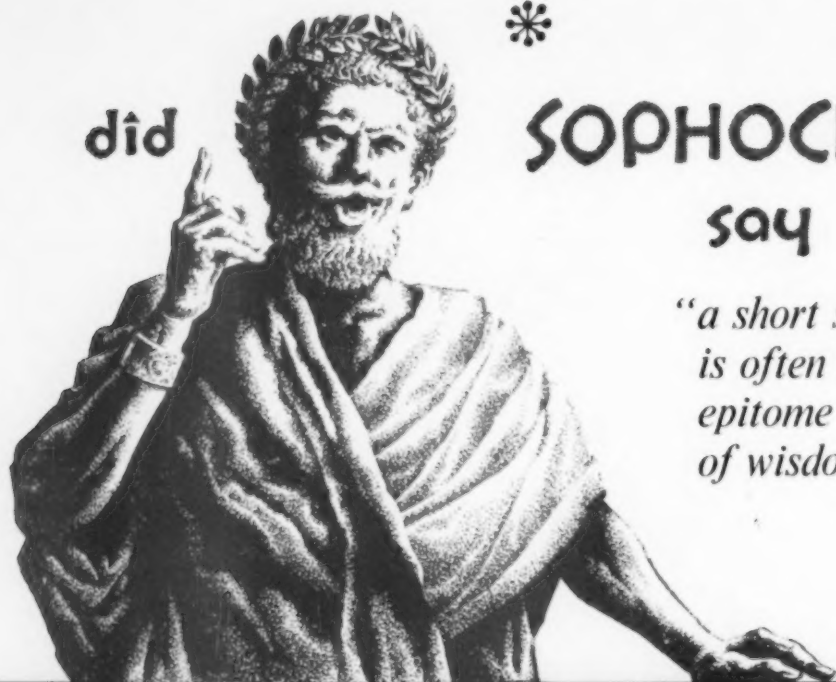
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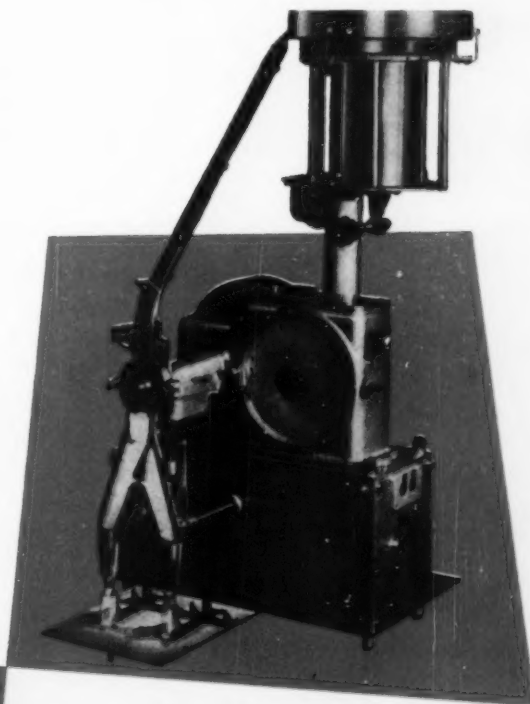
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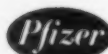
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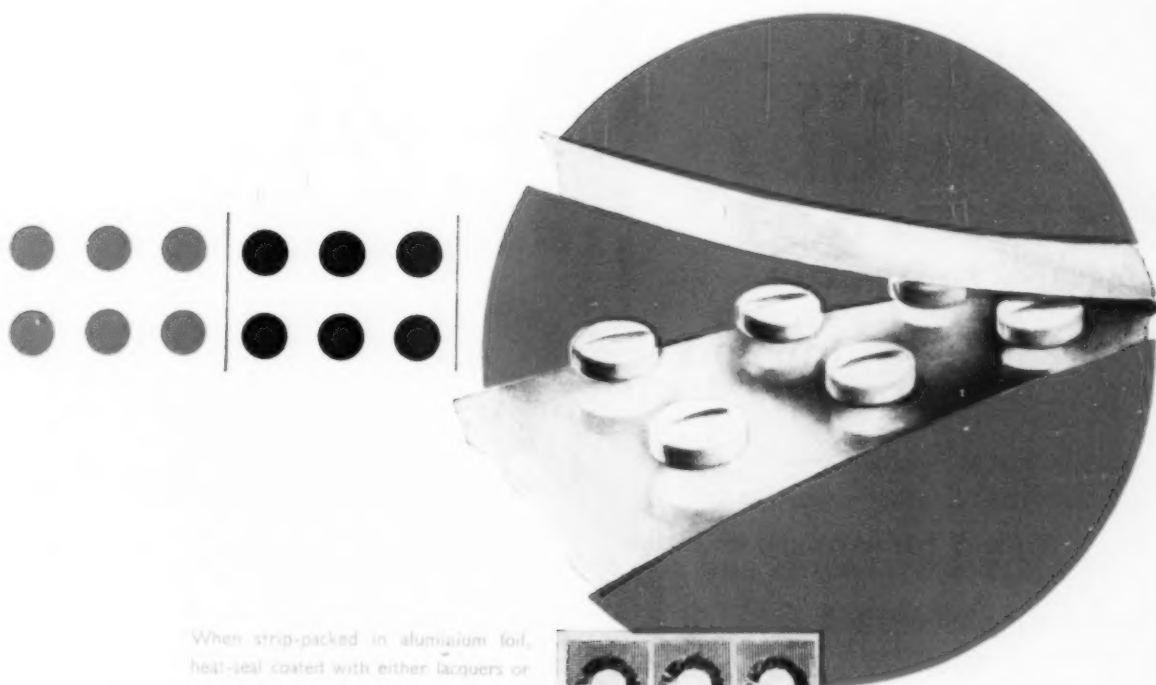
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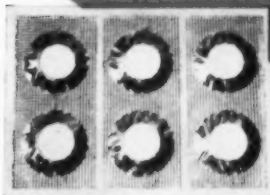
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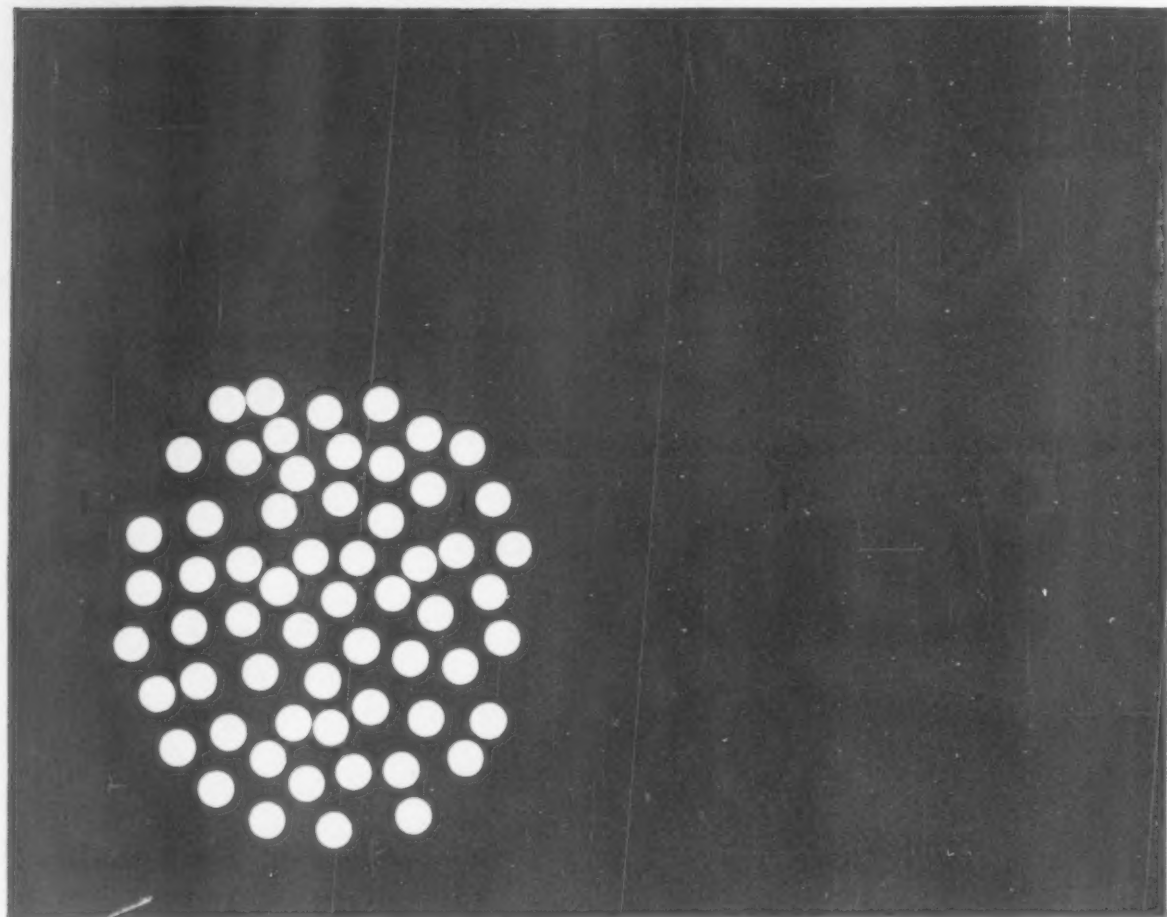
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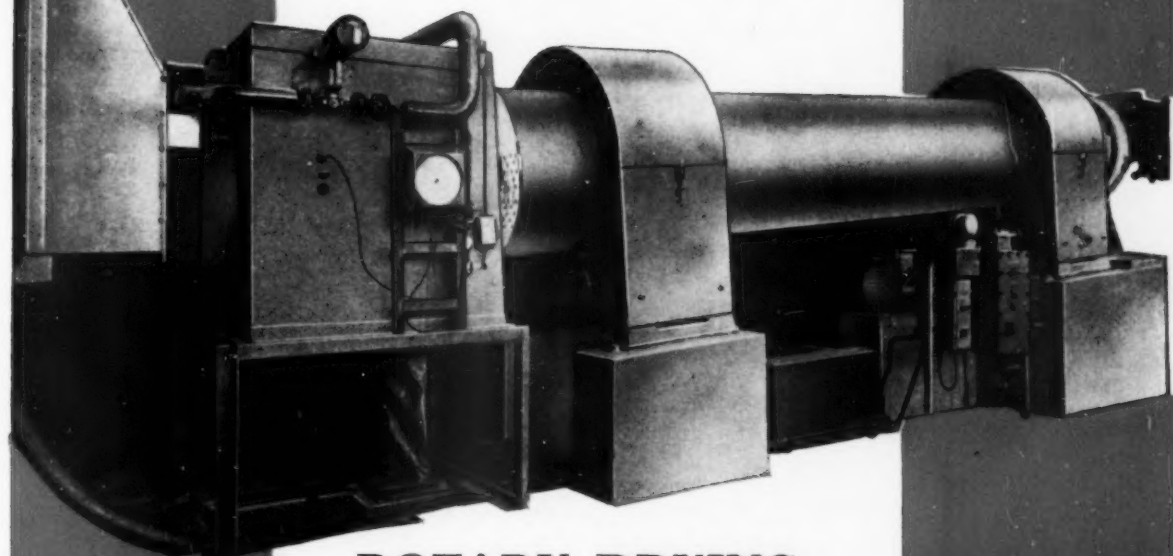


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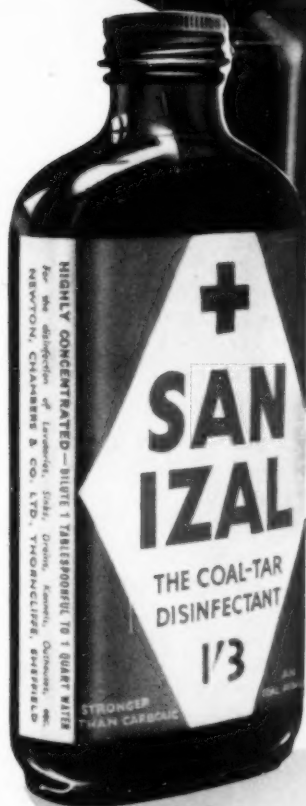
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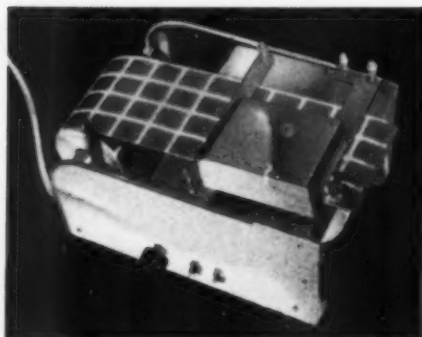
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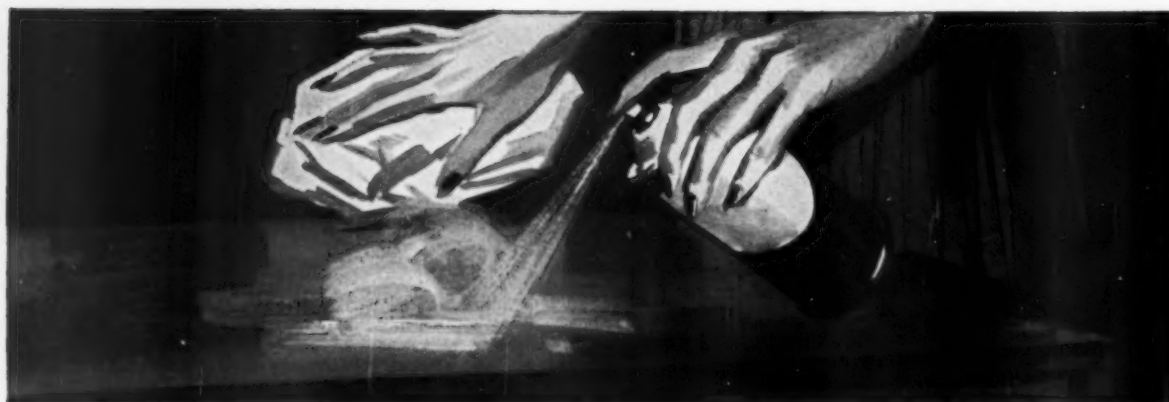
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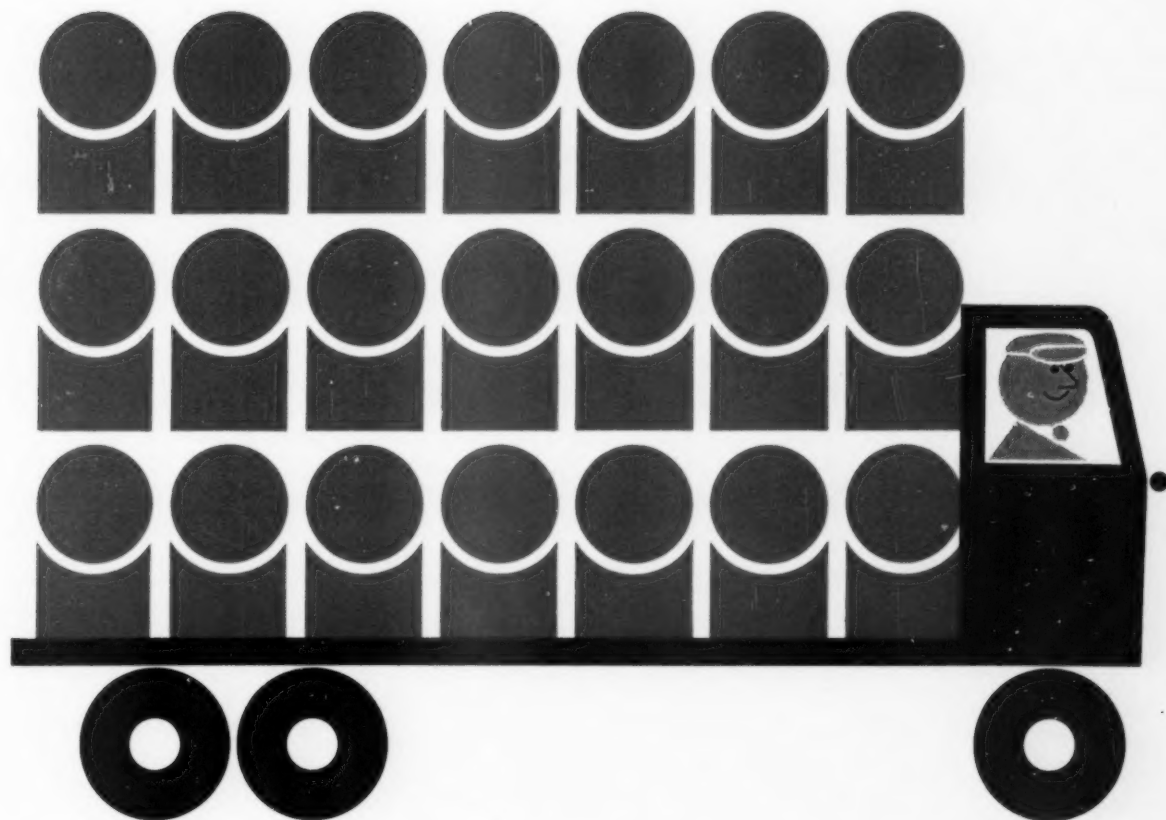
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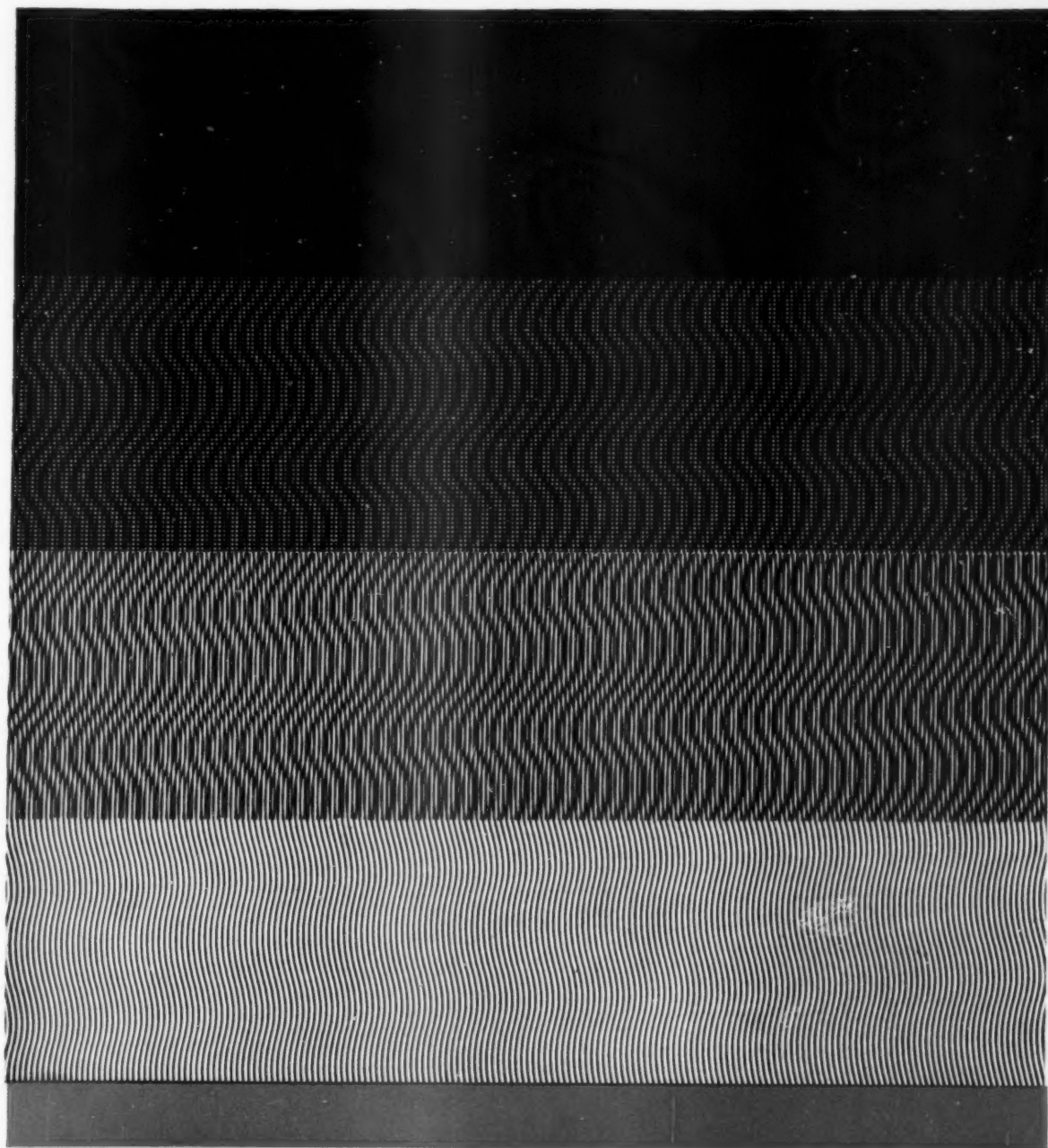
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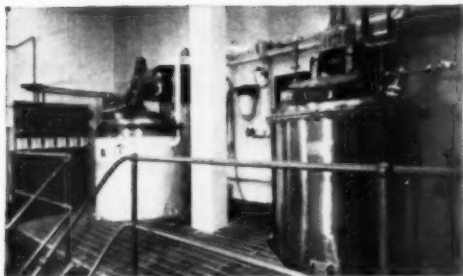


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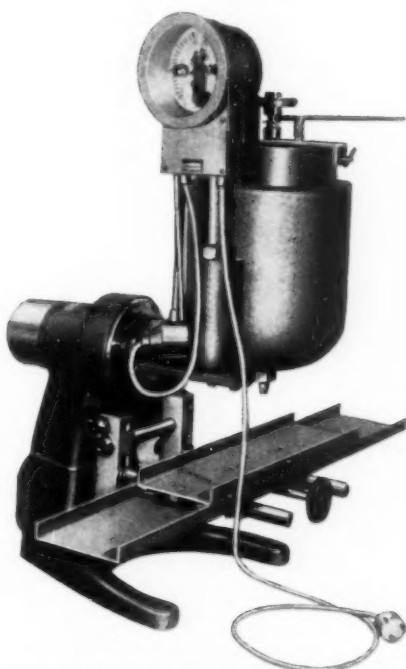
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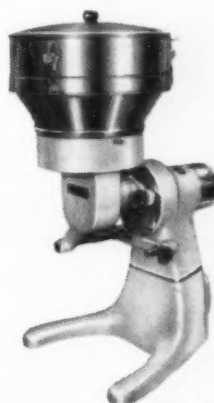
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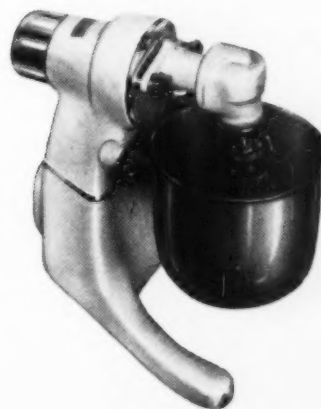


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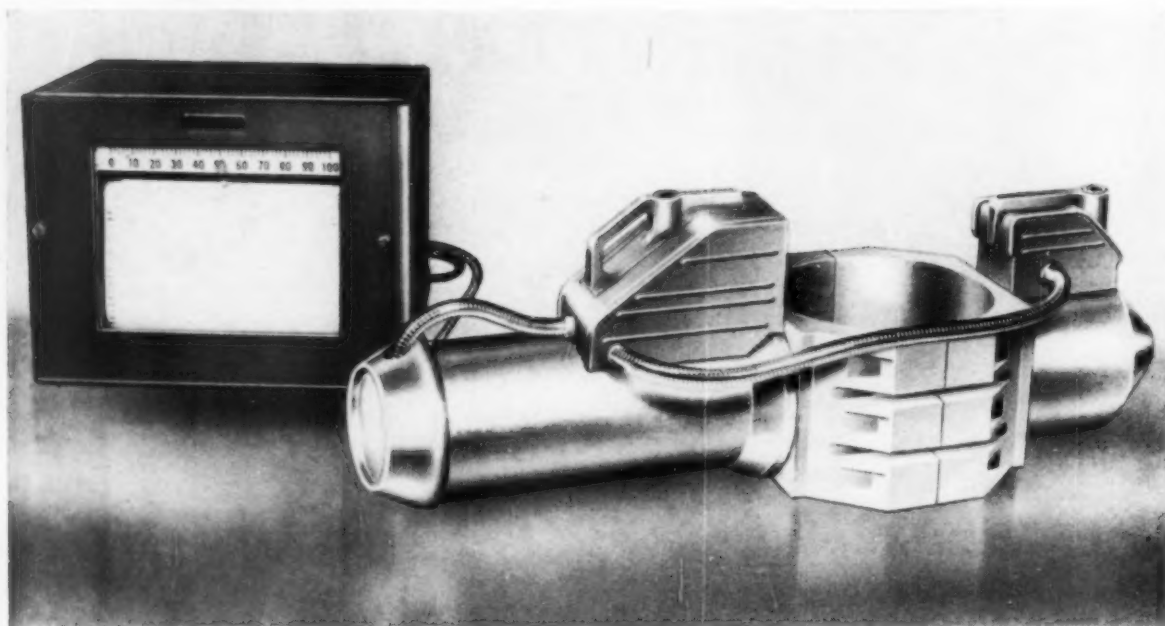
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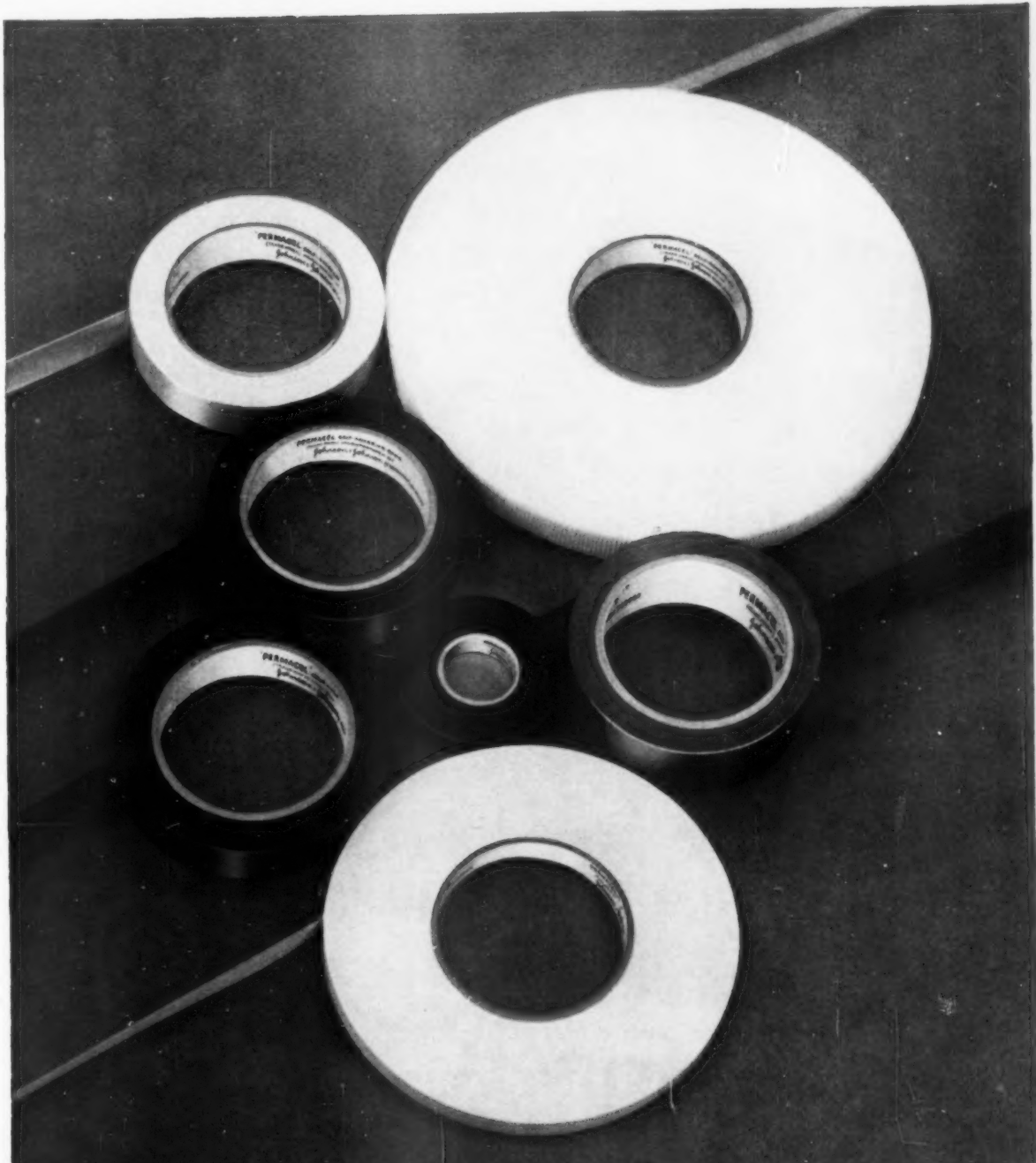
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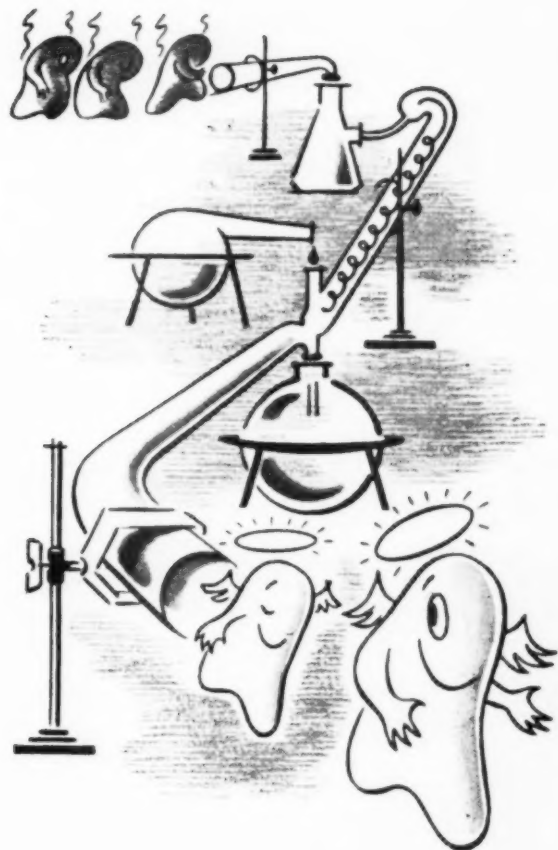
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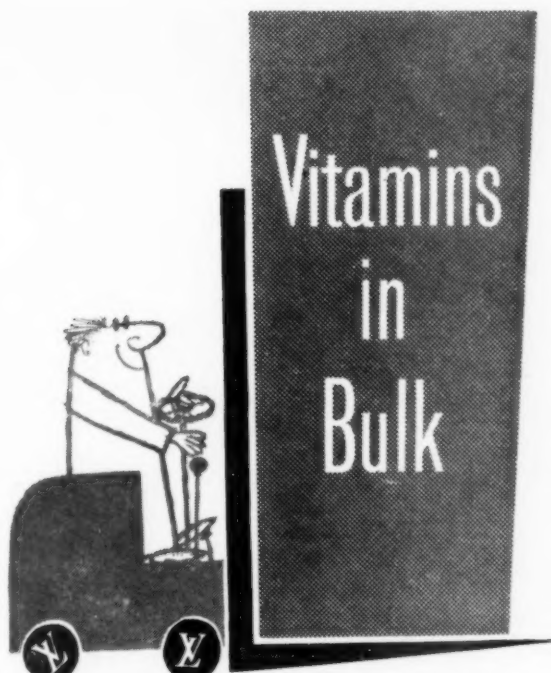
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Manufacturing Chemist

Editor: W. G. Norris

Vol. XXXII, No. 9

SEPTEMBER, 1961

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AN Oxford economist and his wife, Prof. and Mrs. John Jewkes have been "putting the record straight" on the Health Service in a new book called "The Genesis of the British National Health Service" (Blackwell, 6s. 6d.). Informed critics say their essay is highly selective and likely to be taken up by the American Medical Association as ammunition for their campaign against "socialised medicine." If the A.M.A. takes the Jewkes's criticisms as meaning we would rather not have the Health Service with all its defects, they are greatly mistaken. Grumbling about it and trying to improve it is by no means the same as wanting to abolish it. We wonder if the American drug industry is as much against a health service as the A.M.A. If so it is strange that the proliferation of American drug companies in Britain has coincided with the development of the Health Service. "Socialised medicine" seems to be good for the American drug industry.

Having said this let us welcome the Jewkes's comments on prescription drugs. "Every British Government since 1948 has expressed special alarm at the steadily mounting cost of medicines under the National Health Service. . . . Yet the cost of medicines . . . was in 1959 only about 10% of the total cost (of the N.H.S.) and the expenditure per head of the population was £1 10s. . . . In the U.S. drugs accounted for 26% of the total medical costs and the expenditure per head of population was 25 dollars."

This is a confirmation of an even more authoritative view, that of the Hinchliffe report, which showed that the cost of the pharmaceutical service remained at almost exactly 10% of the total N.H.S. cost throughout the fifties. In 1960 the percentage still hovered around 10%—£79 million on prescriptions against a total cost of £726 million.

The A.B.P.I. has reprinted the above extract from the Jewkes's book in full and sent it to M.P.s. The comments would make more impact if read in the context of the complete essay since the authors are saying in effect that whatever else is wrong with the N.H.S. the pharmaceutical services have a pretty clean sheet.

£50,000 per drug

THE A.B.P.I. could powerfully reinforce the campaign for the industry by regularly publishing details about the extremely high cost of developing new drugs. For example, the other day we came upon an article on the safety testing of new drugs by G. E. Paget, M.D., of I.C.I. Pharmaceuticals Division (*Medicine, Science and the Law*, January, 1961). This is what he writes about toxicological testing:

"By the time a drug reaches the sales range of my own firm over 200 rats and some twenty dogs will have been dosed with it at least, and several thousand histological sections will have been prepared and examined. The cost of this will be upwards of £2,000. This excludes the cost of preparation of the compound, which may amount to several thousands of pounds. This must be viewed with the fact that out of every four compounds examined for their toxicity three will be rejected as showing effects too severe to be acceptable in human treatments. Of the survivors of toxicity examination a further 60% will fail at clinical trial for one reason or another. This means that a successful drug will carry an overhead due solely to the toxicological work of upwards of £50,000. In my own firm, two qualified pathologists, four other graduates and fourteen assistants of various grades are occupied full time, or nearly so, in the examination of the toxic effects of new compounds, while in many American firms the toxicity unit is twice or three times as large. It is clear that only a large organisation can support an effort of this size. However, we are convinced that care of this sort is necessary before drugs can be widely used for administration to human beings."

Explosive dusts

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they're **NEW** to Britain!



CAPTOCAP

TAMPERPROOF SNAP-CAPS

REGD.

Prominent pharmaceutical and food manufacturers in U.S.A., Canada and many other countries are already using these caps in very large quantities.

British manufacturers will find the following advantages of special interest:

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- The cap is captive, attached by a hinge to the clamping ring. It snaps shut providing a perfect closure throughout the life of container.
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- The cap is made of polythene. It is hygienic, non-corrosive, impermeable and unbreakable. Supplied in natural or coloured polythene, embossed if desired.
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- Prices are competitive with normal capping and sealing processes.

We are the manufacturers of CAPTOCAP Tamperproof Snap-caps and the Sole Licensees for their use with glass containers in Great Britain. Write for our illustrated leaflet.

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FITTING. CAPTOCAP Tamperproof Snap-caps are easy to fit by hand operated, semi-automatic or fully automatic machines. Existing capping machines can be adapted in some cases. We shall be pleased to advise manufacturers about their existing plant, or supply information regarding special machines.

Thirty shillings a head

AN Oxford economist and his wife, Prof. and Mrs. John Jewkes have been "putting the record straight" on the Health Service in a new book called "The Genesis of the British National Health Service" (Blackwell, 6s. 6d.). Informed critics say their essay is highly selective and likely to be taken up by the American Medical Association as ammunition for their campaign against "socialised medicine." If the A.M.A. takes the Jewkes's criticisms as meaning we would rather not have the Health Service with all its defects, they are greatly mistaken. Grumbling about it and trying to improve it is by no means the same as wanting to abolish it. We wonder if the American drug industry is as much against a health service as the A.M.A. If so it is strange that the proliferation of American drug companies in Britain has coincided with the development of the Health Service. "Socialised medicine" seems to be good for the American drug industry.

Having said this let us welcome the Jewkes's comments on prescription drugs. "Every British Government since 1948 has expressed special alarm at the steadily mounting cost of medicines under the National Health Service. . . . Yet the cost of medicines . . . was in 1959 only about 10% of the total cost (of the N.H.S.) and the expenditure per head of the population was £1 10s. . . . In the U.S. drugs accounted for 26% of the total medical costs and the expenditure per head of population was 25 dollars."

This is a confirmation of an even more authoritative view, that of the Hinchliffe report, which showed that the cost of the pharmaceutical service remained at almost exactly 10% of the total N.H.S. cost throughout the fifties. In 1960 the percentage still hovered around 10%—£79 million on prescriptions against a total cost of £726 million.

The A.B.P.I. has reprinted the above extract from the Jewkes's book in full and sent it to M.P.s. The comments would make more impact if read in the context of the complete essay since the authors are saying in effect that whatever else is wrong with the N.H.S. the pharmaceutical services have a pretty clean sheet.

£50,000 per drug

THE A.B.P.I. could powerfully reinforce the campaign for the industry by regularly publishing details about the extremely high cost of developing new drugs. For example, the other day we came upon an article on the safety testing of new drugs by G. E. Paget, M.D., of I.C.I. Pharmaceuticals Division (*Medicine, Science and the Law*, January, 1961). This is what he writes about toxicological testing:

"By the time a drug reaches the sales range of my own firm over 200 rats and some twenty dogs will have been dosed with it at least, and several thousand histological sections will have been prepared and examined. The cost of this will be upwards of £2,000. This excludes the cost of preparation of the compound, which may amount to several thousands of pounds. This must be viewed with the fact that out of every four compounds examined for their toxicity three will be rejected as showing effects too severe to be acceptable in human treatments. Of the survivors of toxicity examination a further 60% will fail at clinical trial for one reason or another. This means that a successful drug will carry an overhead due solely to the toxicological work of upwards of £50,000. In my own firm, two qualified pathologists, four other graduates and fourteen assistants of various grades are occupied full time, or nearly so, in the examination of the toxic effects of new compounds, while in many American firms the toxicity unit is twice or three times as large. It is clear that only a large organisation can support an effort of this size. However, we are convinced that care of this sort is necessary before drugs can be widely used for administration to human beings."

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require a more severe source of ignition) included a synthetic detergent, calcium citrate and a mixture of phenothiazine and hexachloroethane.

It is well to remember that almost any organic and many inorganic materials are potential explosives when in a finely divided state. For this reason alone—there are others—dust control must be taken very seriously in chemical factories and laboratories.

Keeping the old 'uns on the job

IN LESS than 20 years Britain's population is expected to rise from 52.5 million to 57.7 million. In the same period the number of people 65 and over will increase from 6.1 million to 8.3 million, proportionately a far greater increase than in any other age group. Fortunately this number is likely to remain static while the number of younger people will increase, so that by 2000 the over 65s will be a smaller proportion than in 1980. Nevertheless we are an ageing nation and it is extremely important that people remain fit and usefully employed as long as possible. Now is the time to think of how proper management and training can keep people at work longer. The Medical Research Council* have been looking into the attitudes and policies towards the older semi-skilled worker in some of the larger factories on Merseyside.

Managers and foremen agreed that of the changes which accompany increasing age some are for the better—for example, the older worker is more "steady" and more responsible—while others—such as his slower movement and his slower rate of learning—often tend to impair his working efficiency. The survey also showed that in the eyes of his superiors the worker's skill, born of years of experience, often compensates for the slowing-up that occurs with age, but in the view of the authors an ever-increasing strain is placed on the older man if he continues to do exacting work.

The findings of the enquiry suggest that while it is generally accepted in industry that middle-aged and older men should be transferred from physically heavy work, there is little recognition of the fact that work making a constant demand for speed or for close concentration is probably also unsuitable. Moreover, it appears that the possibilities of change of work are frequently limited; often the only alternative that can be offered involves both loss of status and loss of pay.

An increasing rate of technical innovation in industry may mean that a single group of limited skills will no longer last a man throughout his working life. Both this possibility and the present problems faced by the older worker point to the need for re-training, and the authors suggest that industry should examine methods of training and retraining in relation to the special needs of the semi-skilled worker in the second half of his working life.

* Ageing and the Semi-skilled: A Survey in Manufacturing Industry on Merseyside. M.R.C. Memorandum No. 40. H.M.S.O. London. 5s.

All mixed up

How mixed up can we get? A Belgian perfumery manufacturer says he is "fighting like a lion" in Germany to retain the name English Lavender for his compositions. The Germans, not the English, mark you, are insisting that the name may only be used for genuine lavender oil produced in England. The Belgian manufacturer says that the name does not indicate origin but describes a fragrance when used for a compound or a finished product. Even English toilet preparations claiming to be English lavender are mostly made with French lavender oil, he avers.

Will the Common Market gradually submerge local products into a general European catalogue? Will they make Scotch whisky in Holland and Holland gin in Scotland? Will Cheshire cheese be made in Switzerland and Swiss gruyère in Cheshire? French champagne, Epsom salts, Harris tweed, Brussels lace, Italian vermouth, Danish lager, German *wurst*—will it matter where any of these eponymous products are made when we are all one big European happy family?

A landmark in sterilisation

THE FIRST British company—indeed the first non-American company—to take the plunge into radiation sterilisation is Smith and Nephew. They have ordered from the U.S. a £100,000 Van de Graaff electron accelerator for research into radiation sterilisation of surgical materials and for pilot plant production. At the symposium on sterilisation organised by Smith and Nephew last April at the School of Pharmacy, London, it emerged that radiation sterilisation was particularly suitable for a company handling large quantities of materials such as bandages, plasters and medical dressings. There are two systems: the employment of a radioactive source such as is used at the Wantage Irradiation Plant, and the electron accelerator. Smith and Nephew say they chose the accelerator only after very careful consideration. While this must be a disappointment to the advocates of the cobalt-60 radiation source, it does not rule out this system when the company come to decide on production sterilisation plants.

Smith and Nephew will use the accelerator to devise optimum conditions of sterilisation of the Group's products. This research could ultimately lead to the provision of a very much wider range of pre-sterilised products, thus assisting in the fight against cross-infection in hospitals.

One of the chief advantages of radiation sterilisation over other methods is the possibility of operating the process on a continuous basis and at the same time achieving more effective sterilisation. Radiation methods make possible the sterilisation of articles even after they have been enclosed in hermetically sealed packages such as cachets and plastic film envelopes. The older methods of dry heat or gas

sterilisation often cannot be used with modern packaging materials.

The Van de Graaff machine will produce electrons with energies up to 4 million electron volts at a power output of 4 kilowatts. The machine consists of a large evacuated acceleration tube, carrying at one end a cathode for the production of electrons. These electrons are accelerated down the tube under the influence of a potential of 4 million volts and emerge at the other end of the tube through a window, as a beam of electrons. A special feature of the accelerator is the method of producing the accelerating potential: a charge is deposited on to a moving belt and carried on that belt until it is removed by a collector. The "cleaned" belt then returns for deposition of a further charge. This process is carried out continuously and in this way a potential of 4 million volts is accumulated on the collector terminal to be used for accelerating the electrons in the tube.

In order to avoid the possible risk of danger to those employed in operating the machine, it is placed inside a shield of concrete and the articles to be sterilised are passed into the shield by means of a conveyor. The products which are sterilised are not radioactive and there is no risk of any danger to anyone handling them after they have been sterilised. The machine can sterilise up to 600 lb. of material per hour. It is hoped to have it working within a year or less.

New detergent to end foam nuisance?

THE hope that the new type of alkyl benzene sulphonate would end bubble trouble at the sewage works does not seem as rosy now as when it was introduced two years ago. In their fourth annual report the standing Technical Committee on Synthetic Detergents say that if the present type of household detergents were replaced on a national scale by the new "soft" detergent, the concentration of residual detergent in rivers and canals would be cut by a half and the volume of foam appreciably diminished. But the reduction of 50% is less than has been achieved experimentally on the pilot scale and the Committee cannot understand the difference.

While urging the widespread use of the new soft detergent the Committee states: "We consider that further development or improvement of the synthetic detergent now in use is necessary to achieve the ultimate solution envisaged by the Jephcott Committee." This solution called for a product as efficient as present ones but which would readily decompose at sewage works.

The Committee point out that alkyl benzene sulphonate is a mixture of organic compounds which, though closely related, vary in molecular structure. These variations produce differences in physical and chemical properties which, although minor and not readily detectable, have a considerable effect in determining not only their susceptibility to biological decomposition but also the extent to which they break down. It is this subtle chemistry which makes

so difficult the problem of reconciling the different requirements of the housewife and the sewage superintendent.

If the attempts now being made to modify the ABS molecule prove fruitless, a completely different detergent will have to be sought. There are many candidates, but for a number of reasons, such as cost, limited availability, difficulty of manufacture, and inadequate performance, they are all at present unacceptable as a base for household detergents.

The search—costly, tedious and laborious—must continue.

Raw materials from the tropics

TO A modern but modest building in Grays Inn Road, London, come hundreds of samples of raw materials from the British Commonwealth with requests for advice on their utilisation and exploitation. This building houses the Tropical Products Institute staffed by experts on essential oils, fats and waxes, microbiology, food, drugs and insecticides, fruit and vegetables, fibres and paper making. They assist the newly developing countries to make the best use of their raw materials to raise their own standards of living and to enrich the world. Few tasks can be more important and less publicised. The latest report of the T.P.I. shows that within the limits imposed by money and manpower it is pressing on valiantly.

In 1960 over 900 enquiries for advice and assistance were received from 62 countries. About 10% required laboratory investigation, the rest related to marketing, trading, machinery, packing, storage and transport. There has been an expansion of economic and long-term research by this Institute. This reflects a trend away from short-term enquiries of, for example, a routine analytical nature, in order to help newly established laboratories overseas with their research and development problems. T.P.I. experts travel widely to give on-the-spot help.

An example of the T.P.I.'s work is the development of a Northern Rhodesian plant which yields an oil similar to palmarosa called nindi oil. The oil, which is distilled from the flowers of *Aelanthus gamwelliae*, has an unusually high content of geraniol.

Early last year, Dr. G. B. Pickering, of the T.P.I., visited Northern Rhodesia and suggested to the Development Commissioner and European growers that the development of this oil, which has a high potential market value, should be expanded. The Northern Province, to which the plant is indigenous, is isolated from the main lines of transport and nindi oil would provide a cash crop with a high price-to-bulk ratio. A firm of still manufacturers has designed a small-scale distillation unit for the oil, in preparation for its production in the Province on a hundred-weight scale.

Using a method of distillation suggested by the Institute, it has been possible to obtain nindi oil from the flowers in better yields than previously. There have also been improvements in the quality of the

oil in some instances, but the connection between the different qualities of oil and the methods of distillation is a scientific problem which still awaits a solution.

Already one soap manufacturer has bought trial consignments of the oil for use in toilet preparations. Later, if quality can be maintained at a reasonable price, it is expected to be used in soaps.

Drugs from plants

ANOTHER valuable programme of research at the T.P.I. is the examination of plants for pharmacologically active constituents. Already 314 plants have been tested, including specimens from North Borneo as well as samples from Kew Gardens. A number of alkaloid-containing plants have been found and are being subjected to further tests. Other plants from the tropics have been studied. Aqueous extracts of plants are examined at the pharmacological testing unit at Birmingham University which is financed by the T.P.I. Further chemical work is largely based on the results of these tests. An article on the T.P.I.'s work on drugs from plants will shortly be published in *MANUFACTURING CHEMIST*.

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By the time Thomas handed over his business to his son Joseph, grandson Harry, and three other able men in 1895, an empire, ranging from Australia to America, had been established. (The product was modified and coated especially to titillate the American sweet tooth. Export crates were carefully lined with tin or lead, while all advertising material was printed in the language of the country.)

There could be no greater contrast between Victorian Beecham's and the present company, now building the "most modern antibiotic plant in the world" for the production of new penicillins like *Broxil*, *Celbenin* and *Penbritin*—a company whose total sales last year amounted to £56,344,000—but, thanks to King Pill, we too can say, as those first posters encouraged:

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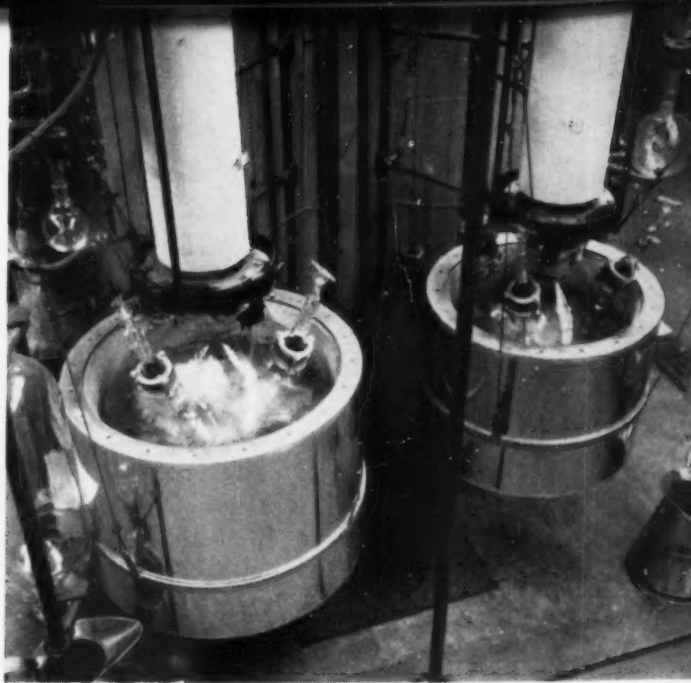
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Analysing indigestion

MAKERS of indigestion pills will be interested to learn that a technique for measuring the digestibility of different foods has been developed in the U.S. by the Stanford Research Institute. When we eat food that we can digest only partially the undigested portion descends to the lower part of the small intestine where bacteria get to work on it. The by-product of this bacterial attack is hydrogen gas and the resulting discomfort depends on the amount of gas evolved, this in turn depends on the constitution of the flora of the individual and the amount of undigested food.

It was decided that the hydrogen evolved could be used to measure digestibility of foods. It passes into the blood stream unchanged and eventually finds its way to the lungs whence it is expelled in the breath. A gas chromatograph was modified to determine the amount of hydrogen in the breath of an individual after eating different foods. In this way the culprit foods could be identified.

According to *Nature* (1961, No. 4776, p. 596), an outcome of the experiments was a technique for making beans more digestible. A chemical and leaching process did the trick without altering their taste.



The stills showing the method of suspension employed. They are freely suspended from steel wires attached via springs to scaffolding erected round each column. Left: Vessels, columns and reflux units held as one unit in supporting frame and the whole still itself suspended. Right: Close-up to show method of suspension and springs which act as shock absorbers.

Compounding Perfumes for the Unilever Empire

By John Palmer

As the biggest makers of laundry and kitchen preparations and toilet soaps in the world, Unilever know how important it is to create the right perfumes for their products. This important work is done centrally by their subsidiary, Proprietary Perfumes Ltd. In their factory at Bermondsey, London, PP produce many hundreds of tons of perfumes for all Unilever factories in Britain and abroad. Here they study the perfume preferences of the millions of people who buy Unilever products and from essential oils and synthetics create a spectrum of scents to suit many different products and markets. How it is done is described in this exclusive MANUFACTURING CHEMIST article.

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At Bermondsey there are three main sections: the manufacturing department, the compounding section and the laboratories. Approximately 50 chemists and technicians are employed in all three areas.

The central oil store keeps large stocks of raw materials. With essential oils, generally sufficient of the crop (to cover 12 months' supply) is bought outright to ensure standardisation of quality.

Manufacturing department

All raw materials when brought into this department are bulked in large tanks prior to being piped to the processing room. If necessary certain materials are centrifuged to remove solid impurities picked up in the growing and distilling areas, such as sand or dust and sediments which may have settled out while standing.

In the processing room stand 50,

100 and 200 litre glass and 450 litre stainless steel reaction vessels. These are used for the synthesis of the various compounds such as ethers, esters, etc., prior to fractional distillation. Raw materials and chemical intermediates supplied by other companies are used in these chemical processes—condensation, esterification, direct oxidation—for producing the synthetics.

In the same department a section also deals with processing of essential oils and eugenol extraction.

When the reaction processes are complete, the products are washed and dried. They are then ready for distillation and the separation of the required fractions.

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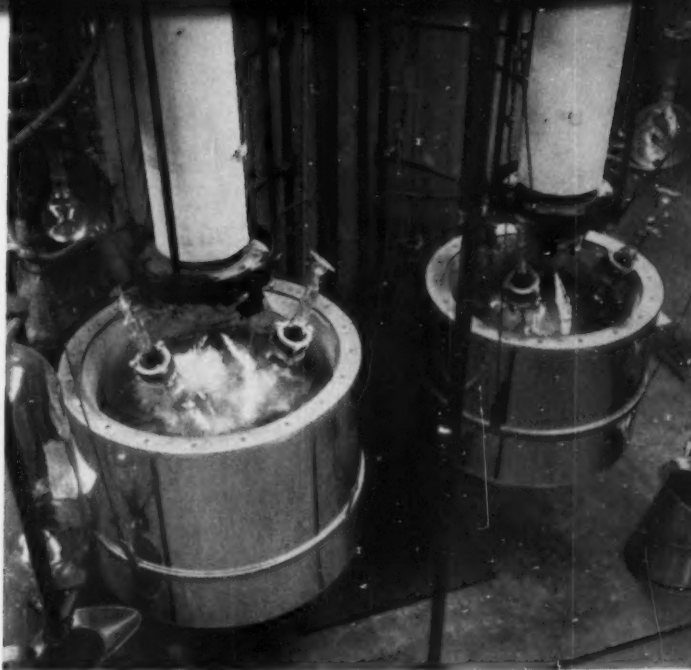
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Manufacturing department

All raw materials when brought into this department are bulked in large tanks prior to being piped to the processing room. If necessary certain materials are centrifuged to remove solid impurities picked up in the growing and distilling areas, such as sand or dust and sediments which may have settled out while standing.

In the processing room stand 50,

100 and 200 litre glass and 450 litre stainless steel reaction vessels. These are used for the synthesis of the various compounds such as ethers, esters, etc., prior to fractional distillation. Raw materials and chemical intermediates supplied by other companies are used in these chemical processes—condensation, esterification, direct oxidation—for producing the synthetics.

In the same department a section also deals with processing of essential oils and eugenol extraction.

When the reaction processes are complete, the products are washed and dried. They are then ready for distillation and the separation of the required fractions.



Part of the receiving and sampling store. Bulk deliveries of raw materials arrive in drums and containers from which they are pumped to the blending tanks.

The still room

There are 30 distillation columns in the still room arranged in two banks down the centre of the room, as well as at the sides. Also round the walls are set the dehydration vessels. All the glassware is made by QVF to the specifications of Proprietary Perfumes. There are two sizes of still—50 and 100 litres. Column heights are 9 ft., 7 ft. 6 in. and 6 ft. The heating elements consist of insulated electric mantles which have been designed and made by the company.

The stills have been erected in a most unusual way. The three sections—flask, column and reflux unit—are held at their connecting points within a rigid frame which allows for slight expansion. This frame itself is supported at three levels by steel wires connected to springs which are attached to tubular scaffolding erected round each still. The heating element unit is also suspended in this manner. This system has proved most effective for minimising shocks that may occur in the vessels during distillation. Bumping is eliminated by a bubble injection system, but even so as an overall safety measure it is imperative to provide a safe seating when so much expensive equipment is involved. This unique method has solved the problem.

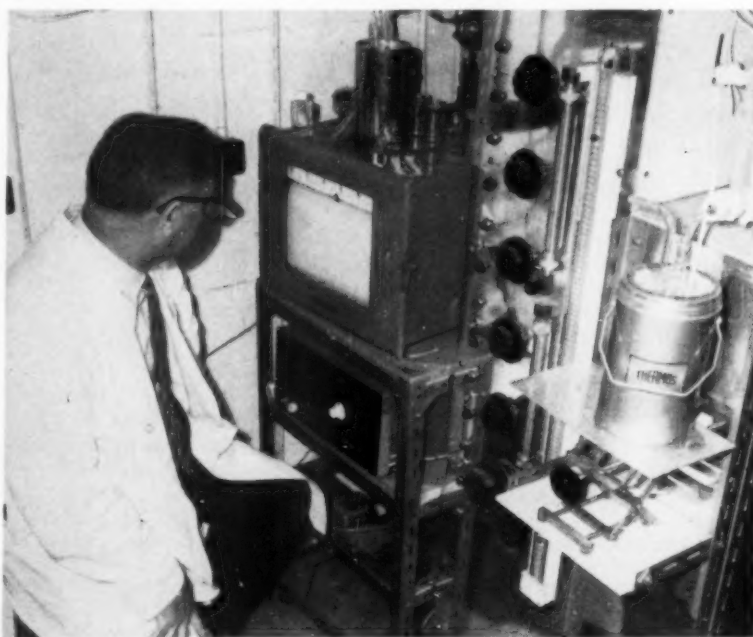
The columns are very well lagged and they also have compensating heaters to make up the slight heat

losses which nevertheless occur. Distillation and rectification are done under reduced pressure.

The control cabinets, which contain the measuring and recording instruments, thermostatic and pressure controls, vacuum pumps, refrigerators, etc., were designed by the company and made by Elliott Bros.

The compounding building

This building has four floors. The lowest is the main bulk storage area (already mentioned) where all raw materials are stored before bulking. Before being put into the 5 ton tanks, the oils are centrifuged to remove waxes, resins or sludges that may have settled out.



Preparative scale gas-liquid chromatography in the research laboratories. This is one of the three instruments designed and built by the company.

From this bottom floor the blends are pumped to the top of the building. Here they are stored in 1 ton and $\frac{1}{4}$ ton tanks. There are 140 tanks each having a pipe leading to the floor below, the compounding floor proper.

Here, bedded in the floor, are the stainless steel compounding tanks. These have capacities of 2, 1, $\frac{1}{2}$ and $\frac{1}{4}$ tons and are used according to the amount of perfume compound that is to be made up. Round the outside of these run trolleys on rails on which are large automatic scales. Above the rails are the pipes leading from the storage tanks, each clearly labelled and provided with a tap.

The five compounders work from "recipes" that detail precisely the substances and weights that must go into each compound. Picking out the largest amounts, the compounder wheels his trolley along the track to the appropriate taps, sets the scales and weighs out the required amount. Very small quantities are weighed out on laboratory balances before addition to the compound. Resins are kept in a hot cupboard and when required are melted in steam pots or else in agitator tanks.

The compounding tanks are not fitted with stirrers but are stirred by hand. This is quite efficient and makes it more simple to get inside the tanks to wipe them clean.

Below this floor is the filling-out floor. The compounded perfumes are piped from the tanks above into 100, 200 and 250 kg. drums. Since the bulk of the perfume manufactured is distributed overseas to Unilever subsidiaries, and since import quota systems in other countries can create difficulties, a whole six months' supply may be manufactured at a time for any one country.

The control laboratory

Samples are taken from all oils and synthetics and passed to the perfumers for examination. They must be checked by analysis to see that the constituents are authentic and also to judge the character of each consignment, since crop fragrances may differ from one year to another.

The sample is subjected to the normal physical tests such as distillation, specific gravity, refractive index, optical rotation, etc., and also the appropriate chemical tests. This laboratory also deals with normal control work throughout the factory.

A further check can be obtained in the gas-liquid chromatography laboratory. This method will give



The hydrogenation room in the organic research laboratory. Here attempts are made to synthesise new products.

detailed information about the composition of the sample very rapidly.

Perfume research

There are two sides to research at Bermondsey. Firstly, there is the work carried out by the perfumers in composing and compounding new perfumes; secondly, there is the continual research into the basic components of many oils, as well as work on new methods of synthesis, new materials and also the compatibility of materials in the perfuming of products with new formulations.

Creation of a perfume

The perfumer's job is to create a perfume in a form which will be of practical value to the marketing companies of Unilever for scenting the many products they make.

The main piece of apparatus in the perfumer's laboratory is the "organ." This is fitted with rows of curved shelves bearing hundreds of labelled bottles of identical size, looking like the keys of a large church organ. Each bottle contains a refined perfumery ingredient and the perfumer assembles these in experimental patterns, testing the best results for suitability for the commercial market. The complete "organ" of a senior perfumer

contains some 1,500 "notes," of which 600 to 700 are in general use.

Using strips of absorbent test papers, the perfumer arranges a bunch of perhaps ten in metal clips. After smelling them, he returns at intervals to find out the difference in smell. From this he can tell, amongst other things, how some ingredients tend to dominate others.

Relying on his memory for odours, he builds up the basic "notes" which may be natural or synthetic oils, then adds some natural oils to give "body," then brings in a trace of one of the strong animal notes to fix the compound, and so on until a balanced, well-rounded perfume has been created.

Next comes the long and detailed work of blending the elements and testing them in the medium in which they are to be used. A special laboratory is provided for this work of testing the perfumes in non-soapy detergents, soap powders, liquid detergents, etc. New scents are included in these products which are then tested to see how they stand up to such conditions as humidity, sunlight, temperature, etc. Accelerated tests do not always give reliable results and although valuable information can be obtained quickly, they are not as sound as shelf tests.

(Continued on page 410)

Combatting DUST AND FUME Hazards in Drug and Chemical Factories

By D. R. Dickinson,* M.P.S.

Good design of plant and careful handling can eliminate dust hazards entirely, but since it is often difficult or impossible to follow this counsel of perfection efficient dust collection systems have to be installed. In the pharmaceutical and fine chemical industries dust control is necessary not only to protect the workers but to safeguard the products as well. Here Mr. Dickinson discusses the nature of the hazards and describes methods and equipment for dust removal. Most of the principles outlined apply equally forcibly to the control of fumes.

FROM the earliest days of civilisation mankind has been concerned with keeping his living quarters clean and with the removal of dirt and debris from his immediate surroundings. Through the ages many different types of sweeping brushes, made in a variety of materials, have been devised.

The earliest attempt to mechanise this chore was the carpet sweeper. This device undoubtedly delighted the Victorian housemaid, as its gentle action spread the dust in an even and barely perceptible layer over the surface of the carpet, meanwhile flicking some of the larger fragments into its collecting box, while the cat, dog and human hair became entwined in the bristles of its rotating brush. These manifestations of its efficacy completely masked its extremely low efficiency, and it remained popular until the advent of the suction cleaner, and indeed it is still on the market.

Unfortunately, similar criteria are often applied to industrial dust control systems, which are considered to be doing their job properly because the collecting chambers are well filled with large-size particles, whereas the finely divided matter which escapes collection is of infinitely greater importance.

To understand clearly the problems associated with dust control, it is necessary to consider the nature and origins of dust, the importance of its control and the methods which are available for this.

The problem in chemical factories

Dust and fumes are created in many industrial processes and the pharmaceutical and fine chemical industry is no exception. The occupier of a factory scheduled under the factories act 1959 is re-

quired to provide ventilation and arrange for the removal of obnoxious fumes and dust when the process employed is liable to give rise to such.¹ This legal obligation to remove obnoxious fumes and dust from the factory is intended to protect the workers. But in addition it is essential to protect pharmaceuticals and chemicals from the effects of contamination. Moreover, dust and fumes can play havoc with the structure of a building and its internal and external decorations.

Processes most likely to give rise to a dust cloud are:

1. The crushing and grinding of solids.
2. Screening, sifting and blending of powders.
3. Granulation, compression and coating of tablets.
4. Conveying and packaging of powders, or other operations involving the handling in the open of dry finely divided powders.

Dust clouds may also be caused by the condensation of volatilised solids, and solids dissolved in volatile solvents can give rise to particularly dangerous dust clouds when sprayed into the atmosphere.

Dusts may cause toxic symptoms, irritate the eyes, mucous membranes or lungs, and cause fire or explosion.

Toxic symptoms may be observed not only by inhalation or ingestion of dust, but also by absorption through the skin, and it must be remembered that many substances, particularly mercurials, are cumulative in their action. Repeated exposure to slight contamination may give rise to very serious conditions, which on account of their insidious onset remain untreated until the unfortunate victim becomes seriously ill. The sex hormones may

also give rise to alarming symptoms through absorption.

Antibiotics present a special hazard, as workers exposed to these substances may become sensitised so that when given antibiotics in a medical emergency they may get worse instead of better.

Silicosis of the lungs is not common in the pharmaceutical industry, as is the case in some other heavy industries, but talc and asbestos, substances commonly handled, may give rise to this condition and need special care in their handling.

Tables of permissible threshold limits for airborne contamination are published² and should be studied with care.

Fire and explosion

The most serious hazard of dusty atmospheres is fire and explosion. Almost any organic, carbonaceous or inflammable material, as well as finely divided metals, may cause dust explosions. Materials likely to be encountered in these industries and which are particularly dangerous are sugar, cereal flours, vegetable drugs, starch, sulphur, hexamine, synthetic resins, cellulose products and finely divided iron, magnesium and zinc.

Many other substances are equally dangerous and continuous vigilance is necessary to ensure that new products or processes and process modifications are not introduced into a factory without due regard being paid to a potential dust hazard. Methods of testing industrial dusts for inflammability are published by the Safety in Mines Research Establishment.³

If a small explosion should occur in some process plant, such as a mill or mixer, it may disturb accumulations of dust on ledges or other surfaces around the plant, creating a

* Glaxo Laboratories Ltd.

large dust cloud. This dust may be ignited from the primary explosion, thus causing a secondary explosion which can be capable of completely wrecking a building. Most serious damage and injury are caused by dust explosions and the associated fire is usually due to the effects of a secondary explosion triggered off by a relatively minor incident.

Dust explosions only occur when the concentration of inflammable dust in air lies within the limits of inflammability, as is the case with inflammable gases and vapours. It is, however, not easy to determine concentrations of dust; dormant dust is not present in the air until disturbed and dusts are not usually confined to one contaminant only. The presence of mixed dusts greatly affects the limits of inflammability, and the concentration of dust present in air is liable to rapid fluctuation from moment to moment as a dust cloud is formed. It is therefore wise to consider all dust-laden atmospheres as potentially dangerous. It is rarely possible to adopt the principle of increasing the dust content of an atmosphere to above the limit of inflammability by the deliberate introduction of dust, though this is employed in coal mines, where limestone dust is introduced to prevent coal dust explosions.

Fire and explosion can only occur if there is a source of ignition. This may be caused by a naked flame, sunshine through glass, sparking of electrical equipment, discharge of static electricity or spontaneous combustion. Since dust clouds contain very large numbers of fine particles, the surface area exposed is very great and oxidation therefore can be very rapid, causing spontaneous combustion.

All electrical apparatus used in dusty atmospheres should be of flameproof or intrinsically safe design, and wherever possible control gear should be mounted outside the dusty area.

Naked flames obviously should not be permitted (clandestine smoking is an ever-present danger) nor should passing railway engines and similar sources of ignition be overlooked.

Static electricity may be generated in mills, sifters and by the conveying of powders, especially in atmospheres of low humidity. All such apparatus should be effectively earthed. Fabric collecting bags may be earthed by sewing metallic braid along their length, and earthing this.



**DUST COLLECTION AT
HELENA RUBINSTEIN'S**

Unit dust collectors, giving individual control to a wide variety of dusts and powders encountered in the cosmetic industry, have been found to be the most practical approach to dust problems in the new Helena Rubinstein factory.

The photograph depicts Unimaster dust collectors with electrified shaking gear and quick release bins and vent pipes discharging to atmosphere, supplied by Dallow Lambert Ltd. to serve Pascall Mixing Machines at the charging and discharge points.

A total of 15 collectors of this type have been supplied in all, serving Pascall machines, Alite mixers, micro pulverisers, cone mixers, sieves and weighing machines and a variety of applications in the powder, beauty grains, hair rinse, lipstick and filling and finishing room.

Methods of collecting dusts

The conventional and only practicable method of collecting dust is by suction and subsequent separation of the collected dust from the air stream. Air is drawn by a fan through a duct to which are attached suitable hoods, cowls or suction points, which should be placed as close as possible to the point of origin of the dust cloud. The less the dust is allowed to spread around, the easier it will be to control. This may appear very obvious when written, but it certainly is not always observed, nor is it always easy to arrange. But some thought and experiment with hood design and position can pay big dividends in improved performance of the collection system.

The collected dust may be separated from the air stream by one or a combination of the following methods:

1. Filters.
2. Gravitational separators.

3. Inertial separators.
4. Electrostatic collectors.

Cloth collectors or bag filters are one of the most commonly employed systems of dust collection. The dust-laden air stream is passed through woven cloth, which holds back the dust particles and allows air to pass. When first put into service the efficiency is low, as the pores in the cloth are many times larger than the particles to be separated, but a layer of dust is rapidly built up on the fabric by impingement on the fibres, entrainment and Brownian movement. After the initial layer of dust is built up on the fabric, these filters can be very efficient. The cloth is usually sewn into circular bags or "socks," the dust-laden air passing from the inner surface outwards. A number of such bags are usually assembled into a single collecting chamber, or in large sizes in a bag-house. For cleaning they are fitted with shakers or rappers, which may be either hand or mechanically operated. Such filters are usually placed on the suction side of the fan, so that the fan is protected, but in the case of large bag-houses, they are built on the pressure side of the fan.

Gravitational separators or settlement chambers are one of the simplest methods of removing dust particles. They consist of a chamber in which the air velocity is reduced, thus allowing the dust particles to settle by gravity. But their efficiency is low as they remove only large particles, above about 40μ diameter. Their efficiency may be improved by hanging curtains, rods or screens in the chamber to reduce turbulence and aid collection by impingement. They may also be used before bag filters, to prevent heavy dust loads on the bags by removing the larger particles.

Inertial separators or cyclones are also frequently used for dust separation. The dust-laden air is led tangentially at one or more points into a circular or conical vessel, the air leaving from the centre, while the dust particles by virtue of their inertia are carried to the outer wall of the separator from which they are led to a receiver, or retained in the base of the cone.

A cyclone is basically a device to aid settlement by exchanging centrifugal force for gravity. Accelerations or centrifugal separating forces of five times gravity may be exerted on the particles in a large low

resistance cyclone which may rise to 2,000 times gravity in small high efficiency devices. A cyclone is most efficient in the removal of particles between $5\ \mu$ and $200\ \mu$ diameter.

Electrostatic collectors are not commonly used except in air conditioning systems or for the removal of ash from flue gases. They can be used for the collection of mists and dusts from industrial gases, and may be employed for cleaning moist gases. High efficiencies can be obtained even with very fine particles, down to 1 or $2\ \mu$, but they are costly to install and maintain. They can be hazardous if the separated dust is combustible in the carrier gas, as discharges can occur when they become loaded.

One point in connection with all methods of dust collection is of paramount importance. It is relatively easy to collect the larger particles of dust, but these are usually not as harmful as the fine particles which fail to be collected. Manufacturers of collecting devices frequently, and in good faith, claim efficiency figures in terms of the percentage of dust collected by weight. A filter may trap 98% by weight of the dust in the atmosphere, but the 2% escaping will contain a vast number of particles of very small size which potentially are far more dangerous than those retained on the filter.

Scrubbers

Where the hazard of fine dust particles escaping to the atmosphere is considerable, it may be desirable to consider the use of scrubbers as a means of collection. In a scrubber a liquid, usually water, is used to remove a dispersed solid from a gas. The method of removal may be by impingement of dust particles on the droplets of a liquid spray through which the gas is drawn, or by diffusion of the dust particles into the liquid droplets in the gas stream by Brownian movement. Alternatively the gas becomes humidified, which may upset the electrostatic forces retaining the dust particles in motion, causing flocculation, or where the gas is cooled below its dew point, condensation with the dust particles acting as condensation nuclei may occur. This condition only occurs with hot gases carrying small amounts of very fine particles. Actual wetting of the dust particles is not a significant part of the process of dust removal by scrubbers. The collected dust is usually removed from the scrubber as a



DUST-FREE TABLETING

Dallow Lambert unit dust collectors have been applied to Manesty Rotopress tableting machines at Winthrop Laboratories Ltd. Dust is created at the points where the powder is tamped into the dies on the machine. The photograph shows a Unimaster 70 model collector equipped with electrified shaking gear and quick-release dust container. Two smaller machines are each served by a Drytex collector, fitted with hand-shaking gear and a removable drawer for the collected dust.

slurry, which may be a convenient form in which to return collected dust to the process, but otherwise disposal can have a considerable nuisance value.

Scrubbers may take the form of chambers in which the air stream carrying the dust is blown through a spray of water, either at right angles to or opposing the direction of air flow, followed by an entrainment separator, or they may combine a liquid spray with a cyclonic action. In this type of separator, the water is sprayed radially, from a central vertical column in a cylindrical vessel, through a spirally moving air stream. Various other mechanical devices for creating a liquid spray in a gas stream have been developed, usually for the treatment of large volumes of furnace gases or similar purposes.

Unit or central collection

One of the main considerations when installing dust collection equipment is whether to have unit collection at each source of dust, or a central ducted system, to collect dust from all sources within the area served by the system.

Where the contaminating dust is of value, or is toxic or corrosive, unit collection at source is preferable, as by this method dust can be collected for recovery and re-use, or disposed of safely.

Another advantage of unit dust collectors is the avoidance of ducting. Unless a building has been designed specially to accommodate the necessary ducts, apart from being unsightly, they often become dust collecting traps, especially if rectangular in section. A thick layer of dust accumulating on an inaccessible upper surface of a rectangular duct is just the place where a secondary dust explosion can be created.

The advantages of centralised dust collection systems are lower cost of installation, less running cost and economy of floor space, but such systems require very careful design and installation and good maintenance if they are to be really effective in controlling dust.

With ducted systems there is always a risk of an explosion occurring within the duct itself, which, if of normal sheet metal construction, would have insufficient strength to withstand the pressure developed by an explosion. The collapse of a duct under these conditions might well create the dust cloud in which a dangerous secondary explosion can occur.

Ducting should therefore be placed outside the building wherever possible and should be provided with pressure relief vents to allow the pressure developed in the duct to be released safely. Such vents should

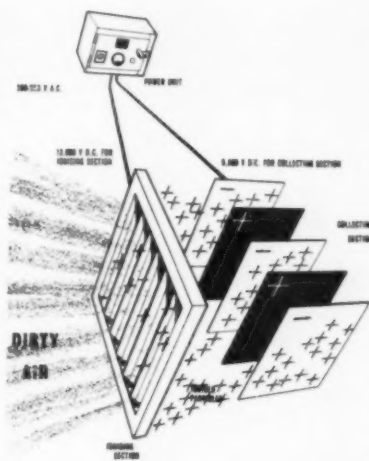
never be fitted inside a building.

During the first few milli-seconds after the ignition of a dust cloud in a duct, there is a slight pressure rise preceding the full force of the explosion. This slight increase is used in one safety system to operate sensitive diaphragms in the ducting, which are coupled through an electronic relay system to the release valves on cylinders of carbon dioxide. The gas is released into the duct, suppressing the explosion before it has had time to build up a dangerous pressure.

An interesting report on pressure relief vents has been published by the Safety in Mines Research Establishment.⁴

Any system of dust collection is at its best only a palliative for a condition which should never exist. A thorough investigation and consideration of the methods of handling materials and of the equipment used for their processing should be carried out before installing a dust collection system, and only when it has been proved impossible to prevent the creation of dust clouds should collection systems be employed. Prevention is always better than cure, and this is particularly so with regard to dust hazards. If there is no dust there is no hazard, and good design of equipment and careful handling methods are a more certain method of obtaining clean working conditions than any collection system.

If, however, the creation of dust proves unavoidable, then this process should be segregated, preferably in a separate building of non-flammable construction, and with the minimum of exposed collecting surfaces on which dust may lodge. If separate buildings are not possible, then the maximum segregation possible within the main structure should be employed, and fire-retardant and blast-resistant partitions placed around the dust-creating process area. Good housekeeping, with regular cleaning by vacuum cleaners, is of the utmost importance, and the area must be well ventilated to remove as much dust as possible. Walls, window frames and roof members should be as free as possible from ledges and irregular surfaces on which dust may be trapped, or adhere. Machine guards should be of smooth sheet metal, not woven wire, and smooth tubular construction for machine stands and stagings is preferable to angle or channel sections.



ELECTRICAL AIR FILTER

The Industrious electrical air filter is a redesigned and sturdier version of the Trion electronic air filter. A further development is a heavy duty filter for use where the dust burden is higher than that handled by the standard filter. With this heavy duty filter, pre-collectors of the multi-cell cyclone type are normally fitted to arrest any large particles which may be present in the extract system. A filter arrangement comprises an ionising section followed by one or more collecting plate sections in series. The combination of these sections is determined by the collection efficiency required and dust holding capacity necessary to give reasonable periods between cleaning. The filters are marketed by W. C. Holmes Ltd.

When a simple extraction system of ventilation or dust removal is employed, the position of the outlet duct should be carefully considered. There is little point in collecting dust within a building in order to spread it over the outside of the same or an adjoining building. The outlet duct must be taken well away from the building and discharged to atmosphere at high level.

Fume removal

Nearly all the comments on dust removal apply with equal or greater force to the removal of inflammable or toxic vapours from working areas. Many vapours are heavier than air, which renders it more difficult to draw them into overhead hoods or cowls. Generally speaking, larger air volumes and higher air velocities are necessary to provide adequate scavenging of the area affected by fumes. It is also necessary to have sufficient air passing through the collecting duct to ensure dilution below the limit of inflammability.

Many industrial fumes are highly

corrosive to sheet metal ducts, and leaks can readily be caused in unobserved places. To obviate this damage and avoid the necessity for frequent and costly replacement, plastic ducting is now sometimes used, but owing to the difficulty of effectively earthing such ducting a hazard does exist, as the passage of gases through plastic ducting can build up static charges. It is therefore particularly important to ensure that adequate dilution is provided to prevent accumulations of explosive mixtures.

The increasing use of radioactive isotopes in industry within the last few years has introduced fresh problems to be taken into account in ventilation and cleaning of buildings where these substances are used. Such a highly specialised subject is outside the scope of this review, but literature on this subject should be studied, where there is any likelihood of this type of contamination occurring.⁵

REFERENCES

1. The Factories Act 1937, as amended 1959: Sections 4 and 47 Ventilation and the removal of obnoxious fumes and dust.
Section 34-7 Means of escape in case of fire.
Section 28 Precautions with respect to explosive or inflammable dust, gas, vapour or substance.
Regulations for Chemical Works (S.R. & O. 1922, No. 731) Part 1, Sections 2-4.
2. Safety in the Chemical Laboratory. Manufacturing Chemists Assn. Inc.
3. K. C. Brown, Research Report No. 21. Safety in Mines Research Estab.
4. K. C. Brown, Research Report No. 22. Safety in Mines Research Estab.
5. Barnes and Taylor, "Radiation Hazards and Protection." Newnes.

Chimney height and design.

The air pollution panel of the Federation of British Industries has been considering the height of new chimneys with particular reference to section 10 of the Clean Air Act. The main recommendations, contained in a handbook which has just been published, refer to industrial boiler plants with an output of 5,000-33,000 lb./hr. steam at maximum continuous rating. Recommendations are also made in respect of larger plants up to an aggregate steam capacity of 450,000 lb./hr. None of the recommendations refer to washed gas effluents. Copies are obtainable from the F.B.I. 21 Tot-hill Street, London, S.W.1, 4s.

DUST AND FUME CONTROL EQUIPMENT

High Efficiency Collection and Filtration Systems

SELF-CLEANING DUST FILTER

Among the other type of plant and equipment for dust collection and removal manufactured by Filter-Heat Ltd. is their reverse jet filter. This represents a marked advance in the filtration of dust from an air stream through a fabric medium.

When conventional woven fabrics are used in dust filters, the air speeds through the material must be kept low to prevent the dust from passing through. In the reverse jet filter, however, it is possible to use a densely woven felt as the collection medium and this allows the dust-laden air to be presented to it at much higher speeds than are permissible with the more usual fabrics. This in turn allows a more compact design of plant for dealing with large volumes of air containing high dust concentrations.

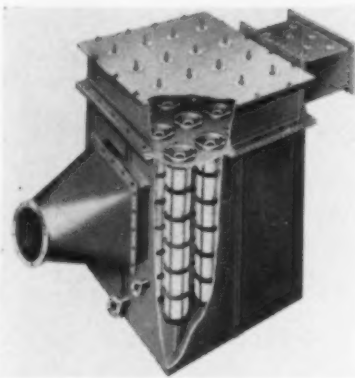
In addition, because this thicker felt collection medium can be used, this plant is particularly effective with small sizes and in most instances an efficiency of over 99% can be achieved even when fine particles are involved.

The cleaning of the reverse jet filter gives it an advantage over the ordinary bag filter. Cleaning is carried out continuously and automatically by passing a polished blowing up and down each filter bag, all the time blowing air through slots in the ring. Therefore, at no time is dust allowed to build up in the collecting medium to endanger the efficiency of the plant. This also ensures that the pressure drop across the collector is constant.

This reverse jet filter has a large number of applications and is only limited in its use by conditions of high temperature or high humidity. Even under these conditions, however, arrangements can sometimes be made to overcome the restricting factor before presenting the dust-laden air to the filter.

FIBRE FILTERS FOR ACID MISTS AND FUMES

As the result of extensive research by the General Chemicals Division of I.C.I., a new and effective type of filter is now available to industries with an acid mist or fume problem. Patented by I.C.I., it is manufactured



This cut-away drawing of the Fumex Filter shows the arrangement of the filter candles which are carried on a P.V.C. plate fitted inside a steel tank provided with a liquor outlet and drain connections. The dirty gas is first saturated by spray nozzles in the inlet, after which it passes through the centre of the candles and is further irrigated by sprays over each candle. The clean gas outlet is fitted to the side of the tank above the liquor level. The Mistex Filter is a similar design in which the irrigated spray nozzles are omitted.

and sold under licence by Mancuna Engineering Ltd., one of the Sturtevant group of companies.

The plants now known as Mancuna-Mistex and Mancuna-Fumex Filters solve a considerable number of gaseous effluent problems with which industry is currently concerned: the former is a dry, and the latter an irrigated form of fibre filter which is highly efficient with high strength acid mists and on many intractable fume problems where the fume is soluble. This type of filter is not intended for very coarse mists or fume where other types of equipment are suitable.

On the basis of the known performance of glass fibre, an investigation was made of the behaviour of various fibres for gas or vapour filtration, and the real basis of the development work which followed and on which the performance of the Mancuna-Mistex and Mancuna-Fumex depends, was the discovery of another class of fibres giving an exceptional increase in filtration efficiency.

Various shapes of the filter media

have been investigated, and the more satisfactory are flat horizontal pads or cylindrical "candles" preformed in a mould at the requisite pressure and temperature to relieve the stresses in the fibre. The filter is built up by the use of appropriate sheaths into the required filtration equipment.

Units have been designed to handle volumes of between 60 c.f.m. and 5,000 c.f.m., larger volumes being accommodated by using a number of appropriately-sized individual units.

The Mancuna-Mistex operates at efficiencies of up to 100% on mists of 2 microns and finer at a pressure drop through the filter of between 10 in. and 11 in. w.g., whilst the Mancuna-Fumex operates at maximum efficiency with a pressure drop of 16 in. to 18 in. w.g.

ELECTRICAL PRECIPITATION OF DUST AND FUMES

Lodge-Cottrell Ltd. are pioneers of the electrical precipitation system of gas cleaning and dust collection, based to a large extent upon original research by Sir Oliver Lodge, and his American contemporary, Dr. F. G. Cottrell.

The system removes fine particles, solid or liquid, from air or gases. One advantage of precipitation is that the particles are normally collected in their original form, dust as a dry powder and mist droplets as a liquid. A further advantage lies in the extremely low pressure drop through the precipitator, rarely more than 0.25 in. w.g. even at efficiencies in excess of 99%. Considering these advantages the capital cost of precipitators is not excessive and the operating costs bear comparison with alternative methods of high efficiency collection.

The company has installed precipitators for magnesite, carbon black, gypsum, alumina, bauxite and precious metals recovery in addition to units on smelters, roasters, calciners, rotary kilns, etc.

The company is equipped to carry out site and pilot tests to establish design conditions, and being a member company of Simon Engineering Ltd., it can utilise the considerable technical and laboratory resources of the Group.

CONTROL OF INDUSTRIAL SMOKE

The B.S.I. Committee which have been investigating how smoke from industrial boilers can be reduced by good practice have published their second report. It covers coal-fired shell boilers with various types of mechanical stokers, and is published as part two of the British Standard on *Measurements of smoke emission* (B.S.2978). It is unlikely that further reports, other than addenda to those already published, will be issued as most other plant in general use comes under the supervision of government inspectors.

To obtain the material on which this report is based the B.S.I. Committee carried out tests on eight shell boilers of modern design, known to be well operated, in various industrial establishments. Detailed records were kept of smoke emission from each of these plants over periods of from three to eight weeks.

A résumé of results for each of the boilers is given in the form of a table, with notes on the frequency with which various associated operations were performed and the level of smoke emission during such operations.

The final conclusion is that "dark smoke from well-designed and correctly operated shell type boilers with mechanical firing equipment of the types tested should not exceed 8 min. in any period of 8 hr."

A helpful section at the end of the report lists factors influencing smokeless combustion in shell type boilers with mechanical stokers.

Copies of B.S.2978, part two, may be obtained from the British Standards Institution, 2 Park Street, London, W.1., price 7s. 6d. (postage is charged extra to non-subscribers).

FILTER CAKE TRAPS DUST

A new development which has proved popular in America, and will now be made available in England through Tilghman's, is a super-clean air filter, suitable for long periods of continuous operation, giving high cleaning efficiency with no maintenance costs. It consists of a normal tubular fabric filter, using an inexpensive filter aid which is charged into the plant on commissioning, and adheres to the inside of the filter material, making a highly efficient filter cake through which the air filters before reaching the fabric. This cake traps dust and foreign matter present in the air or gas being



A 48,000 c.f.m. unit filtering atmospheric air to pressurise laboratories in a large American pharmaceutical company carrying out experiments on animals requiring super-clean air without bacterial content. This equipment is supplied in England by Tilghman's.

filtered, and after a period of between 1 and 3 years, when the pressure drop has built up to approximately 3 in. water gauge, a simple mechanism in the collector is operated, which removes the spent filter aid from the tubes. Re-charging with new filter aid only takes a few hours for a unit handling 50,000 c.f.m. Units are supplied as complete weatherproof plants, unlike other air filters, and therefore are suited for siting out of doors.

Thermocal is a heat transfer medium consisting essentially of ethylene glycol. Aqueous solutions are suitable for use in the range -40° to 100°C . A booklet on Thermocal has been issued by the Heavy Organic Chemicals Division of I.C.I.

Job booklet. Another careers booklet from I.C.I. deals with opportunities for the science graduate in Nobel Division. It is easy to read and attractively illustrated.

KF Moisture Determination. The second edition of the monograph "Moisture Determination by the Karl Fischer Reagent" has been issued by British Drug Houses.

Correspondence

"Freshly Prepared"

TO THE EDITOR,

SIR: In the *British Pharmaceutical Codex* in the general monographs on eye drops and eye lotions and in some individual monographs, it is directed that these preparations must or should be freshly prepared. We have been informed that some of these preparations are being supplied to pharmacists by manufacturers, and that consequently they may be dispensed an appreciable time after they have been made. In the General Notices to the Codex, it is stated (p. xxviii) that the phrase "freshly prepared" indicates that the preparation should be made not more than 24 hr. before it is issued for use. In the next revision of the Codex it is proposed to use the word "must" in place of the word "should" in the foregoing statement. If any preparation to which this directive is applied in the Codex is dispensed from a stock which has been kept for more than 24 hr., it does not comply with the B.P.C. requirements.

C. W. MAPLETHORPE,

Chairman, Codex Revision Committee

S. C. JOLLY,

Editor, *British Pharmaceutical Codex*,
London, W.C.1.

British and U.S. Names

TO THE EDITOR,

SIR: There is mention from time to time in your journal and others of the products ethylene glycol monoethyl ether and diethylene glycol monomethyl ether, which are often referred to as *Cellosolve* and *Carbitol*. These are the registered trade names for the products of Union Carbide Ltd. Shell Chemical Co. Ltd. also manufacture these products in the United Kingdom and sell them under the trade names *Oxitol* and *Dioxitol*.

Since *Oxitol* and *Dioxitol* are used extensively both in the U.K. and overseas we would appreciate it if you would either encourage the use of the chemical terminology or refer to the trade names of both companies in each case.

D. WOLFERS,

Shell Chemical Co. Ltd.,

London, W.1.

Adhesives Formulation and the Rôle of Glycerine

By F. N. Reckless, A.R.I.C.

Mr. Reckless discusses the formulation of a wide range of adhesives, the common denominator of which is glycerine. Many formulæ are given but they represent only a small number of the many available. All those given are versatile and adaptable.

THE commercial development of the glycols and other polyols particularly over the last two decades, has not greatly affected the progress of glycerine in new applications. Of many polyols offered as glycerine substitutes, those that have a price advantage do not often give the desired properties to the product whereas those that do approximate are often either as expensive or even dearer to use. The author still feels that no true substitute has been found for glycerine.

The uses of glycerine are so pervasive that in discussing the rôle of glycerine in adhesive technology attention must be drawn to the use of glycerine compounds as well as the pure substance.

Physical and chemical properties

Glycerine is properly glycerol or 1,2,3, propanetriol. It is a natural substance and is present in oils and fats in the proportion of 10-14%. The pure B.P. grade has the following properties: A clear colourless, hygroscopic syrupy liquid of Mol weight 92.09 and a minimum apparent density at 20°C. of 1.255/ml. g/ml. (In the United Kingdom it is usual for refined glycerine to be sold at a higher strength than this, giving a glycerol content of 99%.) It is soluble in methyl, ethyl and propyl alcohols and water. It is only slightly soluble in esters. However, it is insoluble in most chlorinated hydrocarbons, lower ethers, fixed and volatile oils, and aromatic and aliphatic hydrocarbons. Glycerine has many unique physico-chemical properties, the most important being strong hydrogen bonding activity, particularly when in association with natural polymers, or inorganic compounds that can react to form complex molecules, e.g. borates. Its greatest hydrogen bonding activities occur with protein polymers, e.g. gelatine. An instance of this is the hectograph

formula given later on in this article. The same formula using, say, ethylene or propylene glycol would be semi-liquid.

The hydrogen bonding properties have been suggested as the explanation for the very great solvent activity of glycerine.

Availability

The following grades of glycerine can be obtained commercially in the U.K.:

- (1) Chemically Pure Grade conforming to BS.2625: 1955 and also to the requirements of the British Pharmacopœia (99% glycerol content).
- (2) Technical Grade conforming to B.S.2623: 1955 (99% glycerol content).
- (3) Saponification crude glycerine (88% glycerol).
- (4) Soap-lye crude glycerine (80% glycerol).

Of the above grades, (2) and (3) offer the best advantages in adhesives manufacture. Soap-lye crude (which usually contains about 10% sodium chloride) can be used in cheap vegetable-based adhesives. Saponification crude can be used in gelatine and vegetable based adhesives by making suitable adjustments for the water content in the formula.

Modified glycerine

Distinct from glycerine derivatives, there are modifications of glycerine such as the reaction products of ethylene and propylene oxide, polyglycerols, etc. These are a very interesting group of compounds and can be used when reduced hygroscopicity and greater permanency are desired. One such product has been marketed by the Dow Chemical Co. in the U.S.A. This has been called Hyprin GP25. Chemically it is hydroxypropyl glycerine and has an average hydroxypropyl substitution of 2.5. Its physical properties are as follows:

APHA Colour	=	Max. 300
Viscosity at 25°C.	=	450-1,000 CPS
Specific gravity at 25/25°C.	=	1.07-1.10
Relative humidity (40% water) at 24°C.	=	86%

It is soluble in water, methyl, ethyl and propyl alcohols, lower ketones and aromatic hydrocarbons. However it is insoluble in chlorinated and aliphatic hydrocarbons.

This material has been evaluated in the author's laboratory. It has been found to be a direct or part replacement for glycerine in gelatine compounds, starch and dextrin adhesives where less hygroscopicity is required. It is far more effective in ice-proof labelling adhesives than is glycerine. Non-drying plasticising alkyds that are intended for use in synthetic emulsion adhesives give better compatibility and flexibility when part of the glycerine is replaced by Hyprin. In conclusion this type of product is very useful in formulating adhesives that are intended for use in humid conditions. Polyglycerol can be used similarly but does not give as good results.

Glycerine-gelatine compositions

Compositions of glycerine with gelatine have been used for many years with great success. The growth of the polyvinyl acetate emulsion adhesives at one time threatened to push the flexible glues out of circulation. These have recently come back into favour again as they can offer many advantages over the P.V.A. adhesives.

The author recently looked at a book bound in 1875 in which glycerine-based flexible glue had been used on the spine. Such a flexible glue would be:

Skin gelatine	100 lb.
Water	40 lb.
Technical grade glycerine ..	43 lb.
Beta naphthol	1 lb.
Iso-propyl alcohol	1 pint

A similar composition for use in the manufacture of cork discs for bottle caps would be as follows:

Skin gelatine 250 gm. bloom	20
Skin gelatine 100 gm. bloom	100
Water	46
Technical grade glycerine ..	29
Hyprin GP25	30
Beta naphthol	1 lb.
Iso-propyl alcohol	1 pint

When mixed a solution of hexamine would be added to insolubilise the gelatine.

In hectograph compositions reliance is placed on the unique properties glycerine has when mixed with gelatine. The glycerine helps to facilitate the penetration of the copying ink.

Skin gelatine 250-350 gm. bloom	100 lb.
Water	265 lb.
Technical grade glycerine ..	455 lb.
Cresantol 3	3 lb.

For use in humid climates or in the tropics Hyprin GP 25 can be substituted up to 80%.

Printers' roller compositions have been used extensively over the years. These have been streamlined down to the simple formulae that are good for use with solvent-based inks.

Skin gelatine 200/250 gm. bloom	100 lb.
Water	43 lb.
Technical grade glycerine ..	125 lb.
Beta naphthol	1 lb.
Sugar	25 lb.
Iso-propyl alcohol	1 pint

Decalcomania transfers are again becoming popular and such an adhesive for use on these is as follows:

Skin gelatine 380 gm. bloom	72 lb.
Water	360 lb.
Technical grade glycerine ..	12 lb.
Butyl cellosolve	50 lb.
Soya lecithin tech. grade ..	6 lb.
Beta naphthol	0.5 lb.
Iso-propyl alcohol	0.5 lb.
Ammonium acetate	0.75 lb.

This composition requires an anti-foaming agent. To make the above soak glue in 290 lb. of water, then dissolve at 120°F.-140°F. Stir in 25 lb. of butyl cellosolve. Mix lecithin with 60 lb. hot water, add 25 lb. butyl cellosolve, stir and add to rest of bulk. Dissolve ammonium acetate in 10 lb. water and add. Then add rest of ingredients.

Most of the preceding formulae have been for quality compositions. For a cheap glue jelly for use for stationery and boxmaking the following formula is excellent.

Skin glue 380 gm. bloom	7 lb.
Skin glue 100 gm. bloom	52 lb.
Water	50 lb.
Cane sugar	90 lb.
Epsom salts	28 lb.
Saponification crude	
Glycerine (or soap-lye crude)	15 lb.
Beta-naphthol	0.75 lb.
Iso-propyl alcohol	1.00 lb.



Hand binding—this intent craftsman is using a glycerine containing flexible glue on the spine of a bible.

This requires an antifoam agent.

Vegetable adhesives

These are large volume sellers that give the lowest cost products obtainable. They are also the most versatile group of adhesives. Prior to World War II they were principally made from either starch or dextrin. However, they have met the challenge of the synthetic emulsion adhesives better than any other group. Today they are produced from all kinds of modified starches and starch derivatives and their sales have increased considerably.

Glycerine has remained the best plasticiser for these products. It is used either straight or as starch glycerite or glyceryl borate. Both these products can be made quite simply and offer the advantage of plasticity without affecting the adhesive properties.

In tin labelling pastes this is excellent, as when dried they tend to become brittle, particularly if silicates are used, e.g.

Wheat starch	10 lb.
Water	70 lb.
Bone glue 100 gm. bloom ..	1 lb.
Sodium silicate soln.	10 lb.
Glycerite of starch	1 lb.
Hi flash naphtha	5 lb.

Slurry starch in 30 lb. water. Heat to gelatinise. Add glue to 10 lb. water. When soaked melt and add 30 lb. water. Add starch gel to glue, followed by glycerite of starch. When mass starts to thicken, add silicate followed by 2 oz. Santobrite as preservative.

Glycerite of starch is made by slurring 1 lb. of starch in 1½ lb. water and adding slowly and with stirring to 8½ lb. glycerine heated to 140°C. There will be considerable frothing, but as soon as the bulk of this subsides heat to 130°C. until the mass is translucent.

In office paste the starch glycerite can be invaluable in preventing drying out. The starch glycerite also appears to prevent the too rapid "set-back" that can occur. Such a formula is as follows:

Water	100 lb.
Pregelged corn starch	10 lb.
White potato dextrin (Predex)	167 lb.
Borax	12 lb.

Mix cold until smooth, this gets very stiff. Gradually add

Water	140 lb.
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heat to 175°F. for 15 minutes, cool to 140°F.—add

Caustic soda	½ lb.
Water	2 lb.

Stir and cool to 125°F.—add

Starch glycerite	10 lb.
*Santobrite	1 lb.

* Monsanto Chemicals.

It is in dextrin adhesives that glycerine is most widely used. The advantage of dextrin is that a much higher solids content is possible. This also means a much more rapid "set" and initial tack. A much greater latitude can be obtained in formulating by blending together dextrans of various degrees of hydrolysis and of different starch bases. The main drawback is a

variable tendency to "set back" which can be very bad. Only by careful buying and laboratory control of the raw materials can this problem be minimised. The judicious use of glycerine helps to alleviate "set-back," skinning, and brittleness of the dried film.

A good example of the type of formulations called for is in high speed bottle labelling adhesives and in envelope gums. For the first the following characteristics are necessary:

- High solids content.
- High viscosity.
- Good initial tack and rapid drying.
- Non "webbing" on the rollers.
- No brittle film developing on storage.

To achieve optimum results on the machine a thin even film is necessary. To allow sufficient "open time" and to plasticise the film glycerine is added, preferably in the combined state. Hyprin GP25 can be used, or glyceryl borate. This can be made by heating 1 mol of borax with 1 mol of glycerine at 150°C. for 30 min., adding another 1 mol of glycerine and heating at 140/150°C. for 10 min. and allowing to cool naturally. This is an excellent plasticiser for dextrins and gums and does not affect the tack or the drying of the film in humid surrounds.

In formulating our labelling adhesive we can get a high solids and reasonable viscosity by using a well dextrinised potato dextrin. These dextrins give rise to considerable "webbing." Maize dextrins do not give much trouble here, but do give thicker solutions that "revert" badly. A blend of these can be used and a proportion of finely divided silica added to help "webbing." Such a formula is as follows:

Yellow potato dextrin	..	100 lb.
Yellow maize dextrin	..	10 lb.
Borax	..	12 lb.
Glyceryl borate	..	8 lb.
Water	..	80 lb.
Formalin	..	2 lb.
Fine particle silica	..	0.2 lb.

For the remoistening envelope gum, the desired characteristics are as follows:

- Light colour and transparency.
- High solids content.
- Free flowing.
- To form a film that does not "curl" or "craze" on storage.

Previous work on this has concentrated on using well hydrolysed

dextrins having as low a sugar content as possible, glycerine or glyceryl borate being the chosen plasticiser. The variation in the dextrins leads to problems in the formulation. Very often a good product would be too dark; or if light would curl on storage. A lot of work has been done on these problems. The so-called "dual" dextrins have been developed. The use of polyvinyl acetate emulsions which are stable with dextrins have been explored. All the characteristics mentioned above have been achieved.

The following two formulæ illustrate the old with the new.

Yellow potato dextrin	..	100 lb.
Water	..	56 lb.
Sodium percarbonate	..	1 lb.
Glyceryl borate	..	9 lb.
Formalin	..	10 fl. oz.
Santobrite	..	4 lb.
Oil of Sassafras	..	2 fl. oz.

For humid conditions Hyprin GP25 can be used in place of glyceryl borate.

REGULAR FRONT SEAL GUM

Water	..	126 lb.
Hydrogen peroxide 35%	..	6½ lb.
Yellow potato dextrin	..	360 lb.
Carbowax 1500	..	9 lb.
*E.D.T.A. sodium salt	..	1½ lb.
Saccharine	..	¼ lb.
Heat to 180 F. cool to 110 F.		
Glycerine	..	7 lb.
Formalin	..	1½ lb.
Polyvinyl acetate emulsion (borax stable)	..	32½ lb.
Oil of peppermint	..	½ fl. oz.
* Ethylene diamine tetra acetic acid.		

This formula is a good light-coloured product that has all the desired characteristics.

A good mucilage can be produced from dextrin that is much cheaper than gum arabic and is a nice clear golden colour.

Yellow potato dextrin	..	600 lb.
Borax	..	80 lb.
Water	..	650 lb.
Dicyandiamide	..	12 lb.
Nipagin M	..	1½ lb.
Heat to 165°-170°F.		
Hydrogen peroxide 35%	..	8 lb.
Cool to 110 F.		
Glycerine	..	50 lb.
Glucose	..	70 lb.
Methyl salicylate	..	½ fl. oz.

It should always be borne in mind when working with starches and dextrins that, due to the endless variety of raw materials available, constant revision is necessary. Care should always be exercised therefore in interpreting formulæ.

Miscellaneous adhesives

Natural gums such as gum arabic have been in use over a century and

have given good results. Glycerine is the best plasticiser for these as only small amounts are needed. The amount used is critical, as too little yields a weak film whilst too much causes blocking, or weakness in humid conditions. The lower glycols do not seem as effective.

A typical formula is as follows:

Best gum arabic	..	30 lb.
Water	..	70 lb.
Borax	..	½ lb.
Chemically pure glycerine	..	½ lb.
Santobrite	..	½ lb.

A speciality adhesive using gum arabic that was originally developed for transparent film is as follows:

Powdered gum arabic	..	16½ lb.
Technical grade glycerine	..	16½ lb.
Glyceryl borate	..	13½ lb.
Formalin	..	4½ lb.

The gum arabic is dissolved in the glycerine using gentle heat.

The use of rosin in adhesives is quite widespread, as is the use of ester gum. Ester gum is made by reacting rosin with 12-15% of glycerine at 450°F. It has a melting point about 10°C. higher than rosin. Its value is greater resistance to water and alkalies.

Rosin soap by itself is not a very good adhesive but it can yield good, cheap, fast tacking adhesives with low-grade glue, casein or fish glue. Such an adhesive is as follows:

Cheap rosin	..	36 lb.
Caustic soda	..	4½ lb.
Water	..	36 lb.
Fish glue 60%	..	100 lb.
Glycerine	..	6 lb.
Water	..	120 lb.
Beta-naphthol	..	1 lb.
Iso-propyl alcohol	..	1 pint

Melt the rosin, taking care not to overheat. Dissolve caustic soda in 10 lb. of the water. Add this with stirring, allowing any frothing to subside before adding the next addition. Then gradually add the rest of the water, keeping on the boil. Then add the fish glue, with stirring followed by β -naphthol; then sufficient water to get desired viscosity.

The above formula is versatile and is excellent for paper/paper, paper/glass, paper/plastic, paper/metal. The constituents can also be varied considerably to help in various applications.

Ester gum can be used to the best advantage in solvent-based adhesives. Most resin manufacturers usually have a grade that is substandard for paint and varnish making. This can often be bought as a job lot and effects a saving. Alkyd resins form

(Continued on page 410)

Synthetic Steroids of Medicinal Interest—I

By J. D. P. Graham,* M.D., F.R.C.P.(E).

The synthesis of steroids has become a great industry in which a subtle combination of biosynthetic and chemical methods has made the chemist's control absolute. The sex hormones, which are of more importance than ever before, now that oral birth control has become feasible by their use, are used as intermediates for the production of adrenal steroids. These play an ever-increasing rôle in drug therapy of a variety of diseases.

DURING the last 20 years the steroids have become of great interest in medicine because of the dramatic effect they exert in a wide variety of disease conditions. Knowledge of the physiology and chemistry of these substances has largely been developed by the enthusiasm of pharmaceutical manufacturers.

Steroids occur in plants and animals. The natural steroids have, with few exceptions, the same carbon skeleton of three 6-carbon rings and a 5-membered ring with certain additional substituents. The configuration and numbering of the atoms is as in Fig. 1. The steroid skeleton exists invariably with a *trans*-fusion of rings B/C and usually also of rings C/D. Those steroids with an all-*trans* configuration have a flat planar shape and the angular methyl groups at the ring junctions stick out all on one side or the other. If they all protrude upwards this enantiomorph is designated β and is the natural and active one. The opposite direction gives an α -configuration which may be inactive. The carbon side chain is naturally β -orientated, as is the 11-OH substituent if present, while the 17-OH is α -orientated if there is a side chain and usually β -orientated if there is not.

In naming steroids it is a common practice to avoid clumsy titles by referring the compound to a well-known analogue or reference compound.

In mammals the natural steroids may be classified as the *sex hormones* and the *adrenal cortical steroids*. The former are respectively the female sex hormone *oestrogen*, the pregnancy hormone *progesterone* and the male sex hormone *androgen*.

In the human female, oestrogen is a mixture of oestrinol, oestradiol and perhaps oestrone (see Table 1)

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and is produced after puberty by the follicle of the ovary and also by the placenta during pregnancy. It may be extracted from urine and blood. It has many functions related to the unique growth of the female body, the development of secondary sexual characters and in pregnancy.

Progesterone is 4-pregnene-3,20-dione and is related to the adrenocorticoids by virtue of its pregnane structure. It has a double bond between carbons 4 and 5. It is secreted by an ovarian structure called the corpus luteum which forms after the discharge of an ovum, and the quantity so produced is greatly increased during pregnancy. It has marked effects on the uterus and on the mammary gland. An excess of it in the circulation suppresses ovulation.

The androgens are the simplest class of steroid hormone, non-benzenoid, and have an oxygen function at C-3 and C-17. Testosterone, the most important, is formed in the testis and is responsible for male effects on growth, development of secondary sexual characters and virility. Many adrenocortical steroids, however, are androgenic and a woman with a functioning tumour of this tissue may show marked virilism.

A characteristic feature of the steroid hormones is the vast difference in physiological activity consequent upon slight differences in structure, e.g. testosterone differs from oestradiol only in having a methyl group on carbon 18 and a hydroxyl instead of a ketone on carbon 3. It is perhaps not surprising that the testis of the stallion, that most virile of animals, produces more oestrogen than androgen and that the adrenal cortical hormones (see Table 2) may have sexual functions.

Synthetic sex hormones are used either to replace or supplement

Topics discussed in this article:

- ★ Synthetic sex hormones
- ★ Oral contraception
- ★ Anabolic agents
- ★ Adrenal corticoids
- ★ Synthetics
- ★ Methods of synthesising
 - sex hormones
 - adrenocorticoids
- ★ Analogues
- ★ Spirolactones

supplies which have failed, e.g. oestrogen at the menopause, to impose an unnatural rhythm in the reproductive cycle, e.g. progesterone as an oral contraceptive, or to regulate menstruation, suppress lactation, or to chemically sterilise the opposite sex, e.g. oestrogens in the treatment of cancer of the prostate gland. Most of the natural oestrogens are inactive when given by mouth; synthetics are frequently cheaper and do not need to be injected since they are orally active. Table 1 contains a list of the more important natural and synthetic sex hormones and the structural variants on the key carbon skeleton shown in Fig. 1. There is no side chain attached to carbon 17 other than the two carbon chain of progesterone or simple methyl or ethinyl functions.

Properties of synthetic sex hormones

Ethinyl oestradiol is an extremely potent, orally active oestrogen which is widely used in clinical medicine in doses as small as 0.1 mg. per day for the relief of menopausal symptoms.

In addition to steroids there are a large number of simple molecules with oestrogenic properties.

Stilbæstrol (diethylstilbæstrol) is much less active. It played a great part in therapy with synthetic oestrogens in earlier days, but is now superseded. It is rather toxic.

Chlorotrianesene has a pro-

longed action as it is preferentially stored in fat after absorption. It appears to be converted in the liver into an active intermediate.

Methallenestril is interesting as it is a derivative of naphthalene. It is very potent and easy to synthesise.

Ethisterone (ethinyltestosterone) is an orally active progestogen with delayed action.

Norethisterone is closely related to it and has a better power of absorption and prolonged effect. It is more potent as a progestogen or pregnancy hormone.

Methyltestosterone has the same androgenic properties as testosterone but is weakly active. It is given to be kept under the tongue to allow of absorption through the mucosa. It is suitable when injections of testosterone are undesirable and will correct the deficiency of male hormone in eunuchoids. This hormone does not restore youth, though it will increase libido and vigour in aged males or cause onset of puberty in boys.

Oral Contraception. The regulation of conception by some means which would be cheap, harmless, effective and not related immediately to coitus has obvious commercial possibilities. At present trials are proceeding of the suppression of ovulation by artificially induced dominance of progestogen. One of the substances favoured is 17 α -ethinyl-19-nortestosterone and preliminary results are encouraging, though the price in money is relatively high and possible untoward effects of long-continued abuse of sex hormones are by no means excluded. When combined with an oestrogen menstruation is said to be little affected, but ovulation ceases.

Anabolic agents. The androgenic hormones such as testosterone have other properties than that of creating virility, a concomitant of the rapid growth in bone and muscle which accompanies the change from boy to man. This property of promoting retention of amino-acid nitrogen and electrolytes such as calcium (anabolism) can be of value in countering the effects of wasting diseases such as cancer, in promoting body-building during convalescence, or in countering the opposite effects shown by many adrenal corticoids (catabolism). Obviously if such a use is to be of value in women the anabolic action has to be separated from the male or virilising action. Hence the synthetic anabolic agents of which there are now a dozen.

Table 1
THE SEX HORMONES

Natural						
Estriol	3-OH	16,17-(OH) ₂	18-CH ₃			
Estradiol	3-OH	17-OH	18-CH ₃			
Estrone	3-OH	17=O	18-CH ₃			
Progesterone	3=O		20-CO-CH ₃			
Testosterone	3=O	17-OH				
Synthetic						
<i>Steroid</i>						
Ethinylæstradiol	3-OH	17-OH	18-CH ₃	20=CH		
Ethisterone	3=O	18,19-(CH ₃) ₂	17-OH	20=CH		
Methyltestosterone	3=O	17-OH	18,19,20-(CH ₃) ₂			
17 α ethinyl-19-nortestosterone	3=O	17-OH	19-CH ₃	20=CH		
<i>Non-steroidal</i>						
Stilboestrol	(PhOH) ₂	-(Et) ₂				
Chlorotianesine	(PhCH ₂ O) ₂	-Cl-PhCH ₂ O-				
Methallenestril	(C ₁₀ H ₆ CH ₃ O)-(Et) ₂					

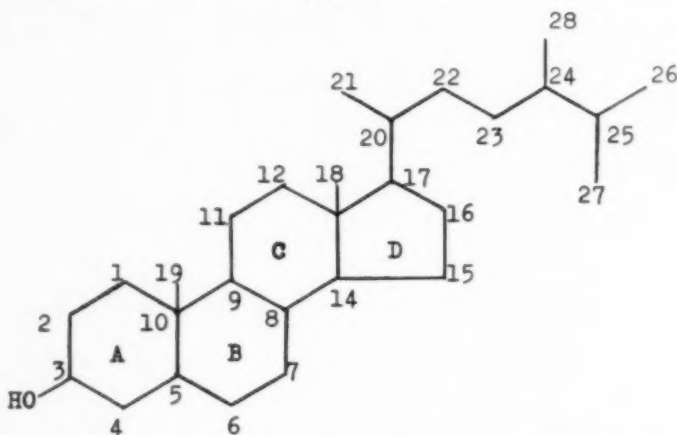


Fig. 1. Key carbon skeleton of sex hormones, see Table 1.

Ethandrolone is Fig. 1 with 3 = 0, 4 = 5, and 17 α -OH.ethinyl : methylandrostenediol is 5 = 6; 17-OH methyl : oxymetholone is 3 = 0; 2-CHOH; 17 α -OH, β CH₃. They are, therefore, related to testosterone in structure. None of them is entirely free from androgenic activity, so that the dosage must be limited and a close watch kept in females for virilising effects such as change of hair pattern, deepening of the voice, shrinkage of the breasts and alteration of sexual drive.

The adrenal corticoids

All the true steroids of adrenal origin have a double bond between carbons 4 and 5 and an oxygen function at carbons 3 and 20 and a side chain containing variable numbers of carbon atoms. They may be considered as derivatives from pregnane (Fig. 1, with no substituent on C-3, and 17-ethinyl) by introduction of a double bond between carbons 4 and 5 (pregn-4-ene) and oxygen (progesterone) or hydroxyl groups (cortisone) at various positions. The adrenal

steroids all have a OH at carbon 21. The simplest synthetic molecule, therefore, is 21-hydroxy-pregn-4-ene-3,20-dione or deoxycortone, the steroid longest in regular clinical use (for 20 years in the form of its acetate, D.O.C.A.). Despite its very close resemblance to progesterone it is in no sense a pregnancy hormone, but chiefly affects the capacity of the cells of the kidney to reabsorb sodium and potassium ions. It was prepared by partial synthesis in 1937. The natural adrenal steroids have in addition a hydroxyl group at carbon 11, e.g. 11,21-dihydroxy-pregn-4-ene-3,20-dione or corticosterone. This substituent proved difficult to supply by synthetic means until a microbiological method was discovered which has made it a matter of bulk culture. An additional hydroxyl at carbon 17 produces cortisol (hydrocortisone), which is one of the two main corticoids of the adrenal gland and is very widely used in the form of an acetate or a hemisuccinate in clinical medicine. The other important natural adrenal steroid, aldosterone,

lacks the 17-OH function but has an aldehyde at carbon 18.

Properties. No less than 40 steroids have been extracted from the adrenal cortex, but only cortisol and aldosterone are of great significance. The first is called a glucocorticoid because it raises the blood sugar level, causes deposition of animal starch in the liver, antagonises the hormone of the islets of the pancreas (insulin) and thus profoundly affects metabolism of carbohydrates. The latter is a mineralocorticoid, *i.e.* it acts on the kidney cells which regulate the amounts of electrolyte reabsorbed from the mechanical filtrate of the blood which is the first stage in secretion of urine. Sodium is absorbed and potassium rejected.

In addition the glucocorticoids have a mysterious but powerful effect in suppressing inflammation, retarding wound healing, depressing the numbers of certain white cells (the eosinophils) of unknown function which circulate in the blood and abolishing many of the normal reactions of the body to sudden shocks such as infection or injury. It is for these properties that cortisol is used in medicine. When applied to an inflamed area of skin the effect may be wholly beneficial, but if taken in excessive amounts by mouth the consequent suppression of natural reactions may be disastrous. No infection is countered, nor healing process advanced, rather to the contrary. In addition to loss of nitrogen which may be marked, calcium phosphate is excreted from the bowel and the consequent thinning of bone may lead to collapse of structure. Obviously these actions preclude the use of steroids in patients with recently healed ulcer, phthisis or fracture, in diabetics or in preg-

nant women. The retention of water which accompanies retention of sodium leads to increase in weight, strain on the heart due to increase in blood volume and may precipitate heart failure or a dangerous rise in blood pressure. It is clear that steroids must not be taken lightly, particularly as the abnormal concentration produced by therapy temporarily suppresses natural production and it is much easier to start a patient on treatment than to withdraw it. It is understandable that attempts have been made to improve on the natural hormones, which are singularly imprecise in their effects.

Synthetics. Once the problem of synthesising cortisone and cortisol was solved, steps were taken to improve upon them. Firstly, a second bond was introduced in ring A to give pregn-1,4-diene; from cortisol comes prednisolone, from cortisone prednisone. Cortisone and prednisone are less soluble than the alcohols.

Prednisolone is four times as potent as cortisol in suppressing inflammation, but has no greater effect on sodium and potassium distribution; the effective dose may thus be lowered.

9-Fluoroprednisolone. The introduction of a halogen atom, especially fluorine, on carbon 9 of cortisol and prednisolone produces steroids of great mineralocorticoid potency.

Triamcinolone has a hydroxyl group on carbon 16. This greatly reduces mineralocorticoid activity and enhances anti-inflammatory potency. This steroid, however, has an undesirably great catabolic effect, particularly in respect to protein (nitrogen loss).

Dexamethasone has a 16-methyl

group. This change has again enhanced anti-inflammatory activity and reduced the sodium retaining effect, which makes it of value in the treatment of conditions which require that relatively large doses of steroid be taken by mouth, *e.g.* rheumatoid arthritis.

(To be continued)

Perfume catalogue. A new comprehensive catalogue has just been issued by Magnus, Mabee and Reynard Inc., of New York. It covers their full range of essential oils, perfume oils, flavouring and seasoning compounds. Well over 1,100 items are listed with current price indications. Copies are available from Jacobson van den Berg and Co. (U.K.) Ltd.

WAVING SOLUTION

A mixture of propyl hydroxybenzoate, glycerine, carboxymethylcellulose and distilled water is applied on the hair before winding it on curlers. (Fr. Pat. 1,174,539.)

METAL POLISH

A cleaning or polishing agent for metals, particularly silver and copper, contains 25-80% of a viscous polyol such as glycerine, up to 20% of an acid such as oxalic, tartaric, malic or citric acid, 1-10% of thiocarbamide, and precipitated barium sulphate as an abrasive. (Brit. Pat. 826,332.)

CLEANING COMPOSITION

A cleaning composition consists of 10 g. of rosemary oil, 5 g. of bergamot oil, 100 c.c. of methanol, 200 c.c. of glycerol, 300 g. of fatty alcohol, 70 g. of sulphonated fatty alcohol, 150 c.c. of butyl acetate, 60 g. of camphor and 150 c.c. of water. (Fr. Pat. 1,190,447.)

PASTILLES FOR DRY MOUTH

A pastille used with success in a case of scleroderma with atrophy of the buccal mucosa and probably also of the salivary glands, consists of:

Gelatine	..	..	20.0
Glycerine	..	..	40.0
Sucrose	..	..	5.0
Lemon essence (Rayner 159)	..	..	0.6
Sodium benzoate	..	..	0.2
Citric acid	..	..	2.0
Amaranth solution	..	..	1.0
Water to	..	..	100.0

The mass is poured into starch moulds and the pastilles partially dried in warm air for 12 hr.—*Lancet*, 1960, **ii**, 1353.

Table 2

ADRENOCORTICAL STEROIDS

Natural

Cortisone	..	3,11,20=(O) ₃	17,21—(OH) ₂	4-pregnene
Cortisol	..	3,20=(O) ₂	11,17,21—(OH) ₃	4-pregnene
Aldosterone	..	3,20=(O) ₂	11,21—(OH) ₂ 18—al	4-pregnene
D.O.C.	..	3,20=(O) ₂	21—(OH)	4-pregnene
Adrenosterone	..	3,11,17=(O) ₃		4-pregnene
Estrone	..	3—(OH)	17=0	1,3,5— estratriene
Progesterone	..	3,20=(O) ₂		4-pregnene

Synthetic

Prednisolone	..	3,20=(O) ₂	11,17,21—(OH) ₂	2,4-pregnadiene
Prednisone	..	3,11,20—(O) ₃	17,21—(OH) ₂	2,4-pregnadiene
Fluorocortisol	..	3,20=(O) ₂	9—F 11,17,21—(OH) ₂	4-pregnene
Fluoroprednisolone	..	3,20=(O) ₂	9—F 11,17,21—(OH) ₂	2,4-pregnadiene
Triamcinolone	..	3,20=(O) ₂	9—F 11,16,17,21—(OH) ₄	4-pregnene
Dexamethasone	..	3,20=(O) ₂	9—F 16—CH ₃ 11,17,21—(OH) ₂	2,4-pregnadiene

ADHESIVES FORMULATION

(Continued from page 406)

another glycerine-containing group of materials that are used in adhesives. These are polyester resins composed of phthalic, maleic and sebacic anhydrides with either glycerine or some other polyol. They can be modified also by the inclusion of various fatty acids of drying or non-drying origin.

The alkyls are most versatile products. They can be formulated into most types of synthetic resins, e.g. vinyls, cellulose derivatives, epoxies, urethanes, phenol formaldehyde resins, etc. They can also under certain conditions be blended with gelatins, starch and casein adhesives. They are necessary with elastomers in producing contact adhesives.

Properly formulated they confer specific adhesion to metals or cellulose films, textiles, rubber, cork and wood. There does appear to be a connection between the polyol used in the resin and the effectiveness when formulated into adhesives.

Such an alkyl resin that could be of value in an adhesive is as follows:

Glycerine	..	..	11½ lb.
Phthalic anhydride	..	..	18½ lb.
Maleic anhydride	..	..	½ lb.
Linseed fatty acid	..	..	20 lb.
Cumar V3-5	..	..	10 lb.

The first four are heated to 450°F. for 1-2 hr. to "C" viscosity on the Gardner scale when thinned 1:1 with xylol. The cumar resin is added and the mass reheated to 400°F. and stirred until melted, when the resin can either be run on to trays or thinned with solvents.

The above formula can be modified in many ways. To give a liquid plasticising alkyl, castor oil or some other non-drying oil fatty acids may be used.

Ester gum can be used in most solvent-based adhesives according to the following formulæ:

RUBBER BASED ADHESIVES

Pale crepe rubber	..	..	100 lb.
Ester gum	..	..	15 lb.
Dichlorethylene	..	..	300 lb.
Petrolatum rubber solvent	..	..	850 lb.

CELLULOSE NITRATE JEWELLERY ADHESIVES

Nitrocellulose film scrap	..	..	100 lb.
Ester gum	..	..	30 lb.
Toluol	..	..	480 lb.
*Alcosolve 1	..	..	165 lb.
Butyl alcohol	..	..	8 lb.
Amyl acetate	..	..	45 lb.
Ethyl acetate	..	..	175 lb.
†Barkite "B"	..	..	11 lb.

* London Solvents Ltd. isopropyl alcohol.
† Howards of Ilford Ltd.

POLYVINYL ACETATE ADHESIVE

Polyvinyl acetate	..	..	100 lb.
Ester gum	..	..	25 lb.
Non drying alkyl	..	..	5 lb.
Amyl acetate	..	..	50 lb.
Ethyl acetate	..	..	150 lb.
Alcosolve 1	..	..	50 lb.
Butyl alcohol	..	..	20 lb.

The above formula can be used for sticking wood/plastic, jewellery, etc.

Polyvinyl acetate emulsions have supplied a major breakthrough in adhesive technology over the last two decades. These are extremely versatile, can be applied cold, diluted with water and easily made.

FAST TACKLING WAXED CARTON ADHESIVE

Dibutoxyethyl phthalate	..	..	10 lb.
Hyprin GP25	..	..	5 lb.
Nevillac 10 coumarone/indene resin	..	..	90 lb.
Ethyl acetate	..	..	20 lb.

Mix above and add to

P.V.A. emulsion (solvent stable)	..	..	120 lb.
10% Aerosol O.T.	..	..	4 lb.

with stirring until smooth.

The use of alkyls with liquid animal glue can yield an adhesive that is very good for laminating work. It is cheaper than a true synthetic or even some of the resin emulsion type. It is useful in finding an outlet for low-grade bone glues. A suggested formulation is as follows:

Liquid animal glue	..	..	40%
Saponification crude glycerine	..	..	2%
Alkyd emulsion	..	..	32%
Paris white	..	..	26%

The liquid animal glue is made as follows:

No. 4 bone glue	..	..	100 lb.
Water	..	..	90 lb.
Naphthalene sulphonate, Na Salt	..	..	21 lb.
Beta-naphthol	..	..	¼ lb.
Alcosolve 2	..	..	¼ pint

COMPOUNDING PERFUMES

(Continued from page 397)

When working on new scents for new products, the perfumers, who incidentally have their own laboratories, generally work on alternative types of products so that there is plenty of variation in the perfuming and their odour memories do not become stale.

Synthesis and separation

One of the important features of the company's work is the synthesis of perfuming materials to suit the product. Traditional materials are

not always stable in such things as non-soap detergents and soap powders or bleaching products and new ingredients have to be discovered for this type of use.

As well as this research into new synthetics, there is also work involved in discovering new methods of preparation and synthesis. A fully equipped pilot plant room is provided to assist in this work.

Another laboratory specialises in the study of the basic composition of essential oils, splitting up these complex materials by distillation and gas chromatography.

G.L.C. in research

The most important recent advance in perfumery research is gas-liquid chromatography. This has made it possible to analyse quickly and accurately a great range of compounds. The company have therefore invested in several gas-liquid chromatographs. Not only are minute amounts detectable, but larger instruments made by PP staff are available for the isolation and collection of materials which cannot be completely separated from each other by fractional distillation.

Success in perfuming

The successful perfuming of all scented products requires intense and prolonged research, for the perfumes must be compatible with the product base and absolutely harmless to the most sensitive skin. Though perfumery is an old art, the work carried out at the PP factory shows that it is at the beginning of great new developments. The list of household washing products grows and so does the complexity of their ingredients. Finding the right scent at the right price is a never-ending task. Unilever are well served by the devoted staff of Proprietary Perfumes Ltd.

Some suppliers of plant and equipment.

Voss:	Stirrers.
QVF:	Glass plant.
Elliott Bros.:	Control cabinets and recorders.
Berkel:	Automatic scales.
A.E.W.:	Hot cupboard.
Pye:	G.L.C. Apparatus.
Frigidaire:	Refrigeration units.
S.S. Vessels:	Stainless steel equipment.

Small-scale Processing Machinery

*Filtration is one of the commonest operations in pharmaceutical processing. It is simple, cheap and remarkably versatile, being capable of purifying both liquids and solids in terms of particulate contamination, sterility, colour and, sometimes, odour. Here Mr. Burt discusses the theory of filtration and from this basis reviews a range of laboratory and small-scale equipment.**

FILTERS

By B. W. Burt,[†] F.P.S.

IN the preparation of pharmaceutical products it is frequently necessary to separate particles from a liquid. Filtration achieves such separations by passing the liquid through a porous barrier. The desired product may be the particulate material such as a biologically active protein precipitate produced during the fractionation of an animal tissue extract. More frequently the liquid is the desired product. This is required to be free from particles which arise as a natural consequence of the method of preparation and which may be amorphous or crystalline precipitates, colloidal hazes, or immiscible liquid drops. It will also be required to be free from extraneous particles such as dust and fibres. It may be required to be sterile and filtration can be used to remove micro-organisms. More rarely, filtration is required to remove extraneous colour and perhaps undesirable odour from the liquid. Finally, both the liquid and the solids may be valuable and need to be separated.

That such a wide range of demands should be met by a comparatively simple operation is remarkable. Apart from the appeal of simplicity filtration is comparatively cheap.

Theory

There have been many theoretical treatments of filtration, but they have little general application to small-scale work mainly because of the variety of materials and procedures used in batch operations. Nonetheless a consideration of theory will provide some basis upon which equipment can be compared and operational procedure better understood.

Most attention has been paid to the rate at which the fluid passes through the barrier. The derivation and application of equations relating flow rate to the viscosity of the liquid and certain dimensions of the filter bed are given in Weisberger¹ for laboratory equipment, by Coulson and Richardson² for production equipment, and are discussed by Wyllie³ for filter media. Most texts dealing with unit operations provide similar material.

Simply, the porous barrier or filter bed can be envisaged as a multiplicity of capillary tubes through which the fluid flows in accordance with the familiar Poiseuille equation. The D'Arcy equation gives practical expression to this idea:

$$\frac{dV}{dt} = \frac{kA\Delta P}{l\eta}$$

or

$$\frac{dV}{dt} = \frac{A\Delta P}{a l \eta}$$

$\frac{dV}{dt}$ = Rate of filtration.
(V being filtrate volume, θ being the time).
A = Area of filter.
 ΔP = Pressure difference across the filter bed.
l = Thickness of bed.
 η = Viscosity of liquid.
k = Permeability coefficient of the bed to the liquid.
a = Coefficient of resistance of bed to the liquid.

If the filter bed is composed of incompressible rigid material this equation will be valid over narrow ranges of pressure differences. It will be noted that for the same liquid at the same temperature (*i.e.* η constant) the permeability coefficient relates the flow rate to the pressure difference across the filter.

Since few filter media are incompressible the permeability coefficient will normally fall in value as the pressure difference increases. Further mathematical treatment is necessary if due to the deposition of particles the thickness of the filter increases throughout the filtration. It is the permeability of this layer of particles rather than the permeability of the original filter medium which dominates the filtration rate.

More recently the model of the filter as a mass of capillaries has given way to another view which treats the barrier as a bed of solid particles with the spaces between them allowing liquid to flow. Although mathematically derived from Poiseuille this treatment emphasises the importance of the void spaces in the filter bed. Thus the Kozeny-Carman⁴ equation may be written:

$$\frac{dV}{dt} = \frac{\epsilon^3 \Delta P A}{a_1 S \eta}$$

ϵ = Porosity; the volume of pore space per unit volume of filter bed.
S = Surface area of solid per unit volume of filter bed (the surface area of the particles).
 a_1 = Resistance of the bed to fluid flow.
A = Area of the filter.
 ΔP = Pressure difference across the filter bed.
 $\frac{dV}{dt}$ = Rate of filtration.

* Sixth in the MANUFACTURING CHEMIST series. 1. Emulsifying Machinery appeared in March, 2. Mills and Sieves in April, 3. Tableting Machinery in May, 4. Mechanical and Convection Dryers in June and 5. Conduction and Radiation Dryers in July.

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Thus the porosity (the voidage) should be high for rapid filtration. The surface area of the solid in the bed is the dimension involved in estimating resistance to flow.

These equations, or modifications of them, have in the main been used to scale up laboratory results to large-scale operations. The main features of these equations may be qualitatively summarised as:

$$\text{Rate of filtration} = \frac{(\text{Area of filter}) \times (\text{Pressure difference})}{(\text{Viscosity of liquid}) \times (\text{Resistance of filter})}$$

Rate of filtration

In considering the rate desired for a particular filtration it may be necessary to consider the subsequent handling of the liquid, especially if any semi-automatic packing or distribution operation is necessary. To avoid storage of filtrate and yet ensure continuous filling it would be convenient to link the filtration and packing or distribution operations. These rates will vary enormously even with similar products; the volume packed may vary between 8 and 80 fl. oz. or for smaller volumes from 1 ml. to 5 ml. Ability to vary the flow rate of an apparatus is therefore highly desirable.

Filter area

If all other factors are kept constant, then the area of the filter available for filtration will obviously affect the filtration rate. Although figures are available for filtering area, close comparisons on this basis should only be made between similar types of apparatus. Most designs

aim at achieving as large a filter area as possible within a small bulk. Extremely ingenious arrangements of filter and ancillary equipment are commercially available, often as conveniently mobile units.

Pressure difference

Pressure is necessary to maintain the flow rate. The amount of pressure required to achieve the flow required will depend upon the permeability of the filter medium and the extent to which this permeability falls off as filtration proceeds. Gravity feed will give pressures up to 5 p.s.i. and may be convenient and satisfactory for coarse filtrations. Perforate bowl centrifuges force the fluid through the filter media by increasing g , thus increasing the weight of the fluid. Suction on the filtrate side of the barrier will give pressures up to about 14 p.s.i. and is often available as a laboratory service. It is not only limited in extent but will obviously be unsatisfactory with volatile liquids which may boil and froth even at low temperatures and result in considerable loss. Liquids normally not considered to be especially volatile will behave in a similar way if filtered hot under reduced pressure. Negative pressure is not desirable for sterilising filtrations, for bacteria may be drawn in *via* leaky joints and contaminate the product. Positive pressure can be used up to 50 p.s.i. and is most convenient for most cases. Normally the liquid is pumped through the filter bed; the pump is carefully chosen to be suitable for

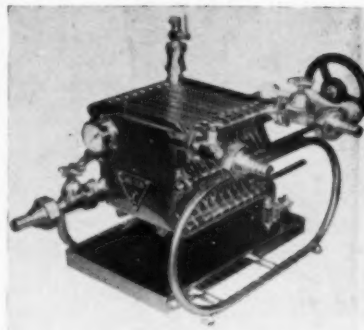


Fig. 2. The Carlson Pilot Princess filter press. The plates are 20 cm. sq. The press is suitable for gravity feed and can also be used for pressure filtration.

giving an even pressure throughout the pumping cycle. Gas or air pressure can be used to force the liquid through the medium and this is especially useful if filtration in an inert atmosphere is required.

Viscosity of liquid

Wyllie³ draws attention to the fact that the flow rate is roughly inversely proportional to the viscosity of the fluid and also to the considerable effect that temperature has on the viscosity of aqueous solutions.

	32°F.	60°F.
Relative flow rate	100	159
Viscosity (centipoise)	1.7921	1.1253

Fluids and solutions are thus much more quickly filtered at higher temperatures if there is a considerable fall in viscosity as the temperature is raised. Apparatus should be able to withstand higher temperatures; many pieces of apparatus can be obtained with jackets which ensure high temperature filtration. These may be used on occasions to cool the press.

Resistance

The "resistance-to-flow" factor depends primarily upon the porosity of the medium and, as filtration proceeds, upon the porosity of the deposited filter cake. Porosity may be thought of in terms of pore size. Many rigid filter media are graded on their pore size which can be determined by the bubble pressure method (British Standard 1752: 1952). It is not necessary to choose a medium with a pore size less than that of the particles it is wished to remove. It is well known that many filters will remove particles smaller than the pores of the medium. This

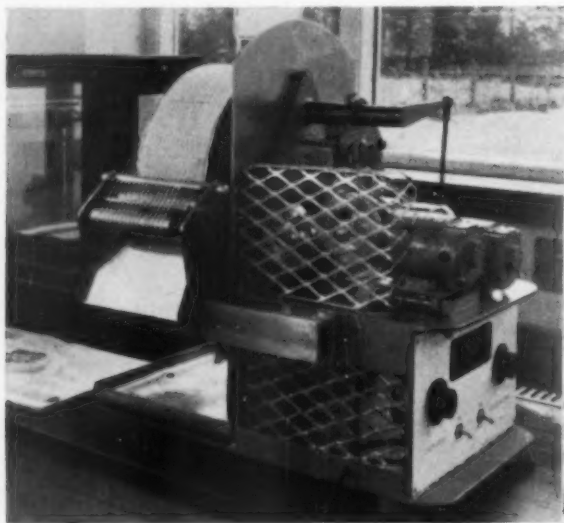


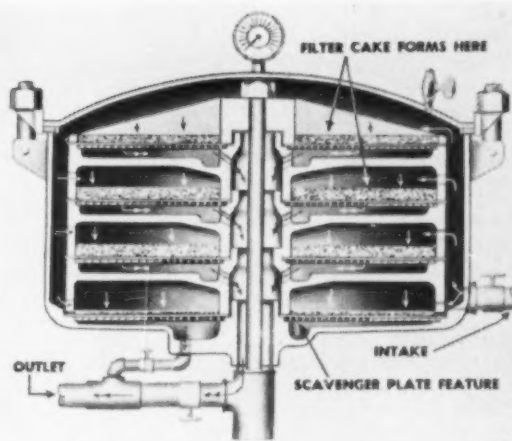
Fig. 1. Stockdale laboratory rotary vacuum filter. The precipitate is discharged via the strings which rotate with the drum.

occurs mainly when the flow rates in the medium are low and the channels through the medium are long and devious. This mechanism becomes less successful when very thin sheet materials are used. Explanations are based on electrostatic or "adsorption" phenomena.

Media of high porosity are required so that flow rates shall be high, but at the same time the desired degree of particle removal must be obtained. The medium porosity will decrease rapidly if the surface becomes coated with a non-porous slimy deposit or if the bulk of the media becomes permeated with fine particles. Both will obstruct the flow of liquid through the medium. Both can be avoided with filter aids which will adsorb fine particles and continually renew the filter surface with deposits of granular solid material. However, as this will inevitably increase the thickness of the cake and thus lower the flow rate, the amount of filter aid should not be excessive. Usually not more than 1% w/v is mixed with the liquid prior to filtration.

Adsorption of particles by either filter media or filter aids will allow larger porosities to be effective. However, care should be taken to ensure that active substances are not adsorbed from solution. This may occur in the very early stages of filtration to a serious extent, especially if the initial concentra-

Fig. 3. The Sparkler laboratory filter. The plates are horizontal and support the filter media and filter cake. The minimum volume required to operate this size is 1½ gal.; a smaller single plate model can filter volumes up to 1 pt.



tion of the active ingredient is very low, as for example vitamin B₁₂ in a syrup.

Many fibrous filter media absorb water when first wetted and the fibres swell. Media may have, therefore, different porosities in non-aqueous liquids and may fail to remove smaller particles which, with the same grade, were removed from aqueous suspensions.

While pressure is required to force the liquid through the media it will also tend to compact both filter, if compressible, and filter cake. As this reduces porosity, high pressures should be avoided, especially during the initial stage of filtration. Pressure may be increased

gradually as filtration proceeds to maintain the flow rate, but in such a way that any sudden disturbance of the filter cake of deposited particles is avoided.

It is the low permeability of the layer of deposited particles which results in a rapid fall in the rate of flow at the start of a filtration. The rotary filter avoids this by removing the deposit and continually presenting a fresh surface for filtration. A laboratory model intended for development work is illustrated, Fig. 1.

Apparatus

The familiar filters used for laboratory analysis need no comment. The catalogues of laboratory suppliers list a wide variety of funnels and flasks and more elaborate apparatus.

For a particular task the choice of an effective method capable of dealing quickly and conveniently with the material will depend on the type and quantity of the solid and upon the volume of the liquid. Batches of 4 or 5 litres can be dealt with in suitably sized laboratory glass and porcelain apparatus. Larger volumes than this can be dealt with in many of the laboratory scale models of production apparatus. There will be minimum volumes that can be used for such models.

The nature of the liquid may limit the range of suitable apparatus and filter media. Thus the volatility, toxicity, inflammability, viscosity and pH of the liquid, and whether it is aqueous or non-aqueous, are factors which influence the selection of the equipment. At the same time the amount and physical state of the particulate matter to be removed will also affect this selection. Crystalline or granular solids are easily

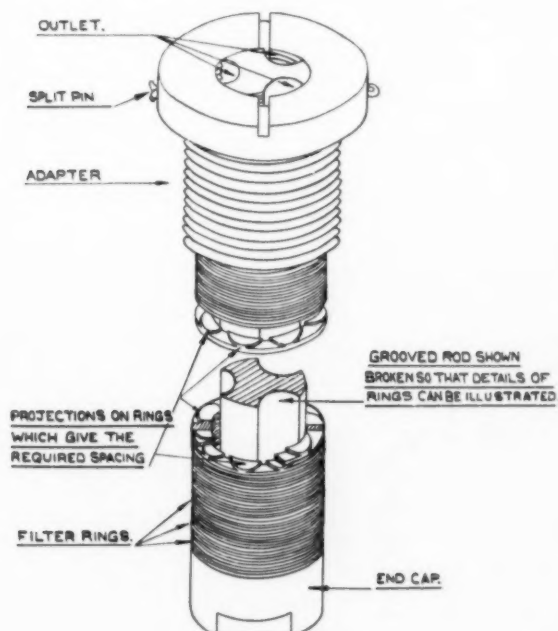


Fig. 4. Detail of the Metafilter filter stick showing rings and supporting rod.

filtered, the bed of deposited particles remaining porous unless it is subjected to high pressure.

Soft gelatinous materials are readily compressed into impermeable layers which quickly block the filter, and very careful control of the pressure is required to avoid this.

Colloidal precipitates are difficult to remove completely, and special filter media may be necessary if clear, "bright" filtrates are required.

For development laboratories it will be an advantage to have in mind the scale on which manufacture is likely to take place and to use, as far as possible, procedures and apparatus which will produce the qualitative conditions expected in large-scale production.

Porous solid filters

Sintered glass filters are well known and widely used in laboratory and pharmaceutical operations. Their main advantage is that they are made entirely of resistant glass which is chemically inert and can be easily sterilised. Many users like to see if the inner surfaces are clean before filtration starts and inspect the state of the filter surface during operations. The four grades available are well described in catalogues of laboratory apparatus; they may be obtained in a large variety of assemblies, from funnels and crucibles of conventional design to pipeline filters used just before filling operations. They are most suitable for clarifying thin aqueous solutions, finding wide application in the preparation of parenteral solutions free from particles. They are not used normally for precipitate collection. The grade 5 is suitable for sterilisation by filtration.

Filtration rates fall off rapidly if much particulate matter is present, also the coarser grades may fail to remove all material if high pressures are used. Cleaning is achieved by a combination of back-washing and chemical treatment. Normally a reasonably easy matter, cleaning can be long and difficult, becoming especially noticeable if coloured substances have been used. No additional filter medium is necessary and they are not used generally with filter aids. Filters of a similar type are made of sintered plastic and of sintered stainless steel. Porous ceramic filters are used in a similar way for clarification and sterilisation and are less easily broken during cleaning and assembly than glass filters.

Filter presses

The filter press is a simple device which gives support to non-rigid filter media while the fluid is forced through under pressure. It is not necessarily a large piece of equipment; Fig. 2 shows a press with plates 20 cm. \times 20 cm. The media, held between the plates, can be woven cloth of natural or synthetic fibre, metal cloth, porous plastic sheet material, or sheets of matted vegetable and mineral fibres. Since the efficiency of the press depends on the filter media, it is important to use the one most suitable for the job. The ability to vary the media gives the press great versatility. Small-scale operation is most convenient with asbestos-cellulose mats, cut to fit easily and quickly into position; like filter papers, they can be rejected when once used. Mats of various grades are available and will deal with "rough" to "fine" filtrations. Sterilisation grades are frequently used.

A laboratory scale version of the filter press made in stout heat-resistant glass can be autoclaved and used to produce a sterile filtrate. From 1 to 16 mats may be used depending on the volume of the liquid and the rate of flow required. As in the larger presses a transfer plate enables coarse particles to be removed by some mats and fine classification or sterilisation to be completed by the remainder.

This press can be used in conjunction with a gas or air pressure reservoir. This too can be made of glass. Thus an all-glass device is available, if this is desirable, which will give a bright clear or sterile product, if necessary under an inert gas.



Fig. 5. Laboratory Metafilter. The material to be filtered is placed on the pressure vessel on the left. The filter stick is seen within the glass shell on the right. Air pressure is used to force the liquid through the filter.

Small presses with plates 20 cm. square will yield 30-50 gal. per hr. of non-viscous aqueous fluids. A pump is normally used to obtain these rates. This can be built into the unit, when it can also be used to pump the fluid from one container to another.

Plates are most conveniently made of aluminium for easy handling and may be coated with plastic or lacquer to avoid metal contact with the fluid. Such coatings are capable of withstanding sterilisation temperatures. Stainless steel presses with a high polish finish are also available, but at a considerable increase in price.

The press is one of the most versatile of filters because—

- (a) the number of filter sheets used can be varied to suit a particular filtration,
- (b) they are capable of a coarse filtration followed by a fine clarification in the same apparatus,
- (c) different types of filter media can be used in the press, and
- (d) the material of construction can be chosen to suit operational conditions.

Most manufacturers of small presses are able to give advice direct from their experience in many fields on the best type and size for a particular job. Vegetable extracts and biological products are notoriously difficult to clarify, especially as at the same time sterility is often required. The filter press is widely used for these tasks. The press has few disadvantages, requiring little maintenance and being simple and easy to handle. Leakage between plates may occur through faulty assembly. Extremely rarely a faulty sheet or pad may necessitate re-assembly of the press. The Sparkler filter (Fig. 3) is entirely enclosed and avoids leakage.

Edge filtration

Edge filters consist of a large number of flat discs stacked one above another, forming a hollow column or stick; a central rod is used as a guide for the rings and is grooved or perforated so that filtered liquid may run along it to the outlet on the top of the rod. The discs may be of filter paper or, now, more usually of metal or other rigid material spaced a short distance apart by raised portions of the disc surface. Figs. 4 and 5 show the Metafilter adaptation of this idea. With this disc base alone only coarse clarifications are possible.

Thus a filter aid precoat is necessary for clarification; generally diatomaceous silica of a suitable grade is used for this purpose, although decolorisation can be achieved with a carbon precoat. Filter aid is added to the bulk fluid as well so that the formation of compact "skin" on the surface of the medium is avoided.

Metafilters are available in many sizes. Capacity depends on the number and length of the filter sticks. There is a very small laboratory test model, but a large single stick model is a convenient size for small-scale work and will deal with quantities down to a few gallons. It is most useful for dealing with syrups and other viscous aqueous solutions, and oils. A pump forces the fluid through the device under positive pressure. The filter bed falls away if the pump is stopped so that cleaning and recoating is rapidly and easily achieved. The space between the discs can be cleaned by backwashing, but after a period of continuous use it is necessary to loosen the ring in order to remove all solid particles lodged between them. The filter and pump conveniently mounted on a wheeled base, are widely used for clarifying syrups, oils, and other viscous pharmaceutical solutions.

Filter leaf

In this apparatus, an example of which is shown in Fig. 6, the filter leaf supports the medium on a wire mesh stretched on a stout metal frame. The fluid passes through the medium from the outer surface to the inner and flows out *via* a tube set into the frame. The apparatus is designed to deal with suspensions containing a considerable proportion of solids. There is little limitation to the thickness of filter cake that can be formed, and it provides free access of the suspension to the filter area. The leaf is immersed in the suspension and the pressure gradient applied by means of either suction on the outlet pipe or positive pressure on the containing vessel. Laboratory size apparatus of this type has recently become available with the intention of providing an experimental model of the large size plant. Filter bags are provided of a very wide variety of materials. Cloths are available of stainless steel, nylon, glass, wool, felt and other materials.

The volume held in the filter is about 1½ gal., and with the filter area at 100 sq. in. the volume of the cake can be as much as 62 cu. in. It can of course be used for clari-

fication, either precoat or bulk mixing, with filter aids.

Metal contact is unavoidable in any apparatus of this type, but with the liquid contact parts made of stainless steel this is rarely a limitation in pharmaceutical products.

Filter aids

Kielsulghur (diatomaceous earth) is the material now in general use in aqueous fluid clarification. It provides a convenient and effective method of removing very fine particles from a "hazy" liquid. The colloidal "haze" is adsorbed by the larger particles of filter aid which are themselves readily removed by the

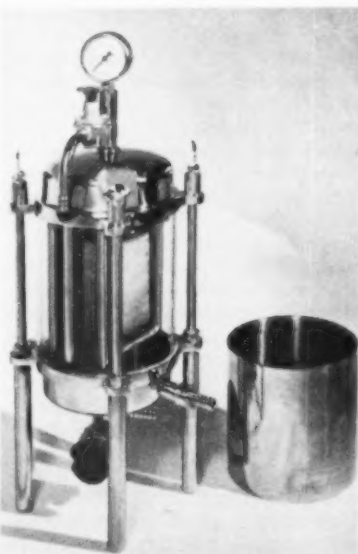


Fig. 6. The Niagara laboratory filter leaf. A glass shell is fitted in the filter; the alternative stainless steel shell is shown at the side.

filter. In practice it is usual to mix some filter aid with the liquid, while more filter aid is used to precoat the filter medium. The filter cake will maintain a high porosity throughout the filtration cycle. Without a filter aid gelatinous material will frequently form an impermeable compact layer when under pressure, often stopping all further flow. The filter aid will prevent this compaction, which is also likely to occur with flocculated precipitates which are compressible.

Charcoal may be used for adsorption of colour as well as colloidal solid. Special aids are available for use for oil clarification.

Grades of differing adsorptive capacity are available and occasional

difficulty may be encountered if the supplier fails to maintain the quality of the material.

Diatomaceous earth is incorporated in special cellulose/asbestos filter mats to improve their adsorptive capacity.

As with all filter materials which rely on adsorption, care must be taken to see that the active principles are not themselves removed. The total quantity of the ingredient removed is possibly very small, but may be a considerable proportion of the original concentration.

Needless to say, filter aids cannot be used if the solid is the required product. Furthermore, the filter aid should not yield any soluble matter to the filtrate.

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Laboratory supplies. Gebrüder Martin of Tuttlingen, Germany, have issued a catalogue of their laboratory equipment and supplies. It fills 144 large pages plus an index and it is in four languages: German, English, Spanish and French. It is profusely illustrated with line drawings and printed on heavy paper with a plastic binding. Multi-lingual catalogues like this will be more than ever needed with the growth of the Common Market. Martin set an excellent example with this handsome book.

Vapour pressure thermometers. An up-to-date 8-page publication (List 25/1) describes the vapour pressure thermometers manufactured by the Cambridge Instrument Co.

Target—Russia. A new brochure published by the Heavy Organic Chemicals Division of I.C.I. is printed in English, French, German and Russian. It was originally produced for the Moscow Trade Fair.

Gas liquid chromatography. Primarily intended as a comprehensive brochure to describe the new version of the Pye Argon Chromatograph, a new publication contains details of many recent chromatographic techniques.

ANALYTICAL CHEMISTRY

By C. A. Johnson, B.Sc., B.Pharm., F.P.S., F.R.I.C.

*Automatic analytical methods • Pesticides • Organic chemicals
Inorganic chemicals • Drugs and pharmaceuticals • Fixed and essential
oils • Steroids*

Automatic methods

Automatic methods of analysis are becoming increasingly important not only for laboratory use but also for the continuous monitoring of plant process flow lines. A few examples described in recent literature will serve to draw attention to the wide range of methods and techniques which are capable of automatic treatment.

Gas chromatography¹ offers one of the more obvious methods of continuous monitoring and it has found considerable application in the petroleum and petro-chemical industries. Because it is essential for the response to be reproducible in instruments designed for automatic use, the various parameters must be controlled very rigorously. A very significant advantage in the use of the gas chromatograph for automatic work lies in the fact that it does not lose its ability to separate and measure a number of components; other techniques such as infra-red analysis and refractometry can usually be applied to determination of only a single component when automated. On the other hand, gas chromatography is limited by sample volatility.

Flame photometry² has also been adapted to automatic operation, particularly for repetitive determinations of sodium and potassium in clinical laboratories. In an Auto Analyser apparatus a proportioning pump delivers the sample and other fluids to a dialyser, the flow from one side of which goes to waste while that from the other is delivered to the flame photometer burner, together with propane and oxygen. The photometer output is registered by a recorder which gives a continu-

ous record of results, sample by sample. The automatic determination of penicillin in fermentation broth has been referred to in a previous report, but one method, based on the conversion of penicillin to penicilloic acid and its subsequent reaction with iodine, was not referred to.³ This method has now been modified to overcome certain experimental difficulties and to improve the precision.⁴ The samples are diluted manually to bring the concentrations of reactants into the range of the colorimeter and recorder employed. Penicillinase is included in the diluent so that the automatic stage, carried out in an Auto Analyser, is limited to iodination of the penicilloic acid, mixing with starch solution and subsequent measurement of excess iodine as its blue complex. Forty measurements can be made in an hour, which represents 18 determinations, since four of these are standards and half the remainder are blanks. The standard deviation of the method is reported to be 2 to 2.5%, which is comparable with that of the standard manual titrimetric method for determination of penicillin. In this case the automated method permits a fourfold increase in the daily output of samples.

A final example demonstrates the ingenuity which is being brought to bear in the automation of analytical processes. A method has now been devised for the determination of nitrogen by a system of continuous digestion using the Kjeldahl principle, followed by automatic colorimetric determination of the ammonium sulphate so formed as indophenol.⁵ With the Auto Analyser unit available for the colorimetric

determination the main problem centred around the digestion phase. Provision had to be made for continuous introduction and removal of the digestive mixture and for intermittent or continuous introduction of the material to be digested. Time had to be allowed for reductive or oxidative stages to occur and, of course, it was necessary to isolate each stage in the digestive procedure from other stages and from newly introduced sample. These problems were overcome by using a digestion vessel consisting of a glass tube with helical indentations as shown in Fig. 1. When the tube is rotated liquid introduced at one end is moved in separate portions to the other end. The whole tube, which is approximately 23 in. long, is capable of being maintained at a suitable temperature (adjustable from room temperature to 700°C.) and the degree of digestion of any particular type of sample may be controlled by variation either of temperature or of the rate at which it passes the length of the digestion vessel. After automatic cooling and dilution of the issuing digestion mixture the ammonium sulphate is determined in an Auto Analyser by the indophenol method. The digestion module is shown in Fig. 2.

Pesticides

Organo - phosphorus compounds. A general method for the determination of organo-phosphorus insecticides in vegetable materials has been developed by Laws and Webley.⁶ In earlier work these authors described a method for the extraction and determination of demeton-methyl⁷ and this is augmented in the present paper to determine not only the water-soluble insecticides but also those preferentially soluble in light petroleum. Sliced vegetable material is macerated with dichloromethane which serves as a general extractant. Petroleum-soluble and water-soluble fractions are then separated by partition between light petroleum (40° to 60°) and 15% methanol-water. The former group are then treated by chromatography on alumina using light petroleum as eluting agent, and the latter by chromatography on carbon using chloroform. The insecticides (the

method has been shown to be applicable with reasonable results to 18 important phosphorus-containing insecticides) are isolated in a reasonably pure condition so that a variety of methods for final determination are available. The authors preferred spectrophotometric determination of phosphorus as the molybdenum-blue complex. In general it would be possible to determine residues of the order of 0.10 p.p.m. in a 50 g. sample.

Lindane. The purity of lindane (which contains not less than 99% by weight of α -benzene hexachloride) may be determined with considerable accuracy by differential refractometry.⁸ The specialised apparatus which is essential for such a determination is not available commercially, however. A cryoscopic method, investigated by Toops and Riddick,⁹ also gives accurate and reliable results, but again an elaborate apparatus is necessary. Handley¹⁰ has now developed a cryoscopic procedure which makes use of a simple freezing-point apparatus and a mercury-in-glass thermometer. The virtue of this technique is that it requires apparatus which can be constructed in most laboratories and that closely agreeing results were obtained when inter-laboratory collaborative tests were made. It was established that the purest specimen of lindane available had a freezing-point of $112.87 \pm 0.02^\circ$ and that the addition of 1 mole-per cent impurity caused a depression of 0.73° .

Organic chemicals

Amines. A new analytical method has been proposed for the colorimetric determination of aromatic amines and imino hetero-aromatic compounds based upon the formation of intensely coloured azo dye cations by reaction with 3-methyl-2-benzothiazolone hydra-

zone followed by oxidation with ferric chloride.¹¹ Positive results are given with many primary, secondary and tertiary amines, but substitution in the para position and substitution with nitro groups both tend to reduce the sensitivity of the reaction. Beer's Law was obeyed over the range 4 to 64 μ g. of *N,N*-dimethylaniline per ml. of test solution when the recommended procedure was used. An alternative procedure for use only with basic aromatic amines gives a measure over the range 0.4 to 8 μ g. per ml. The principal drawback of this procedure would seem to be the serious interference of aliphatic amines, aldehydes and ketones.

The same authors have also described a method which can be used for the determination and characterisation of *N,N*-dialkylanilines.¹² This depends upon reaction with 5-nitroisatin chloride to give blue-green substances having characteristic absorption spectra. Aniline and *N*-alkylanilines give no significant reaction, but phenol, α -naphthol and indole all react with the reagent to give chromogens which might interfere.

Glycols. Potassium dichromate oxidation has been used for the determination of concentrations of the order of 1% of diethylene and triethylene glycols,¹³ particularly where these were accompanied by other components which rendered refractive index measurements inapplicable. The sample is heated on a steam bath for 2 hr. with a standard amount of dichromate and a sulphuric acid concentration of 30% for diethylene glycol or 28% for triethylene glycol. After cooling and diluting the reaction mixture excess dichromate is determined by addition of iodide and titration with thiosulphate. In neither case does the reaction proceed to completion and it is quite clear, therefore, that

the conditions set down must be rigidly observed. Using the empirical factors given, recoveries of 98 to 101 of diethylene glycol added to typical accompanying materials were achieved by the authors. Similar recovery experiments applied to his own particular problem would be necessary before an analyst could confidently make use of this method.

Benzyl esters. The carbo-benzyloxy group and benzyl esters are finding increasing use as protecting agents in the synthetic chemistry of peptides and polysaccharides. A simple volumetric method for their determination in the micro- and semimicro- ranges has been proposed based on quantitative conversion to benzyl bromide by treatment with hydrobromic acid in glacial acetic acid.¹⁴ The benzyl bromide is then reacted with aniline, when hydrobromic acid is formed and titrated with sodium methoxide. Recoveries obtained on 7 to 11 mg. weights of a variety of compounds containing the benzyloxy group ranged between 97 and 102%. High values were obtained when methyl and ethyl esters of carboxy-benzyloxy amino acid derivatives were analysed, due to partial conversion of alkyl groups to the corresponding bromides, but this side-reaction can be prevented by a modification of conditions.

Alcohols. A colorimetric method for the determination of isopropyl alcohol in the presence of methyl, ethyl or *n*-propyl alcohols has been described by Ginther and Finch.¹⁵ This depends upon oxidation of the alcohol in solution (0.1 to 1.0 mg. in 5 ml. of water) by heating with potassium persulphate solution in a closed flask for 15 min. at 80° followed by addition of sodium bisulphite, sodium hydroxide and ethanolic salicylaldehyde solution. After a further 15 min. heating at 80° and adjustment of the cooled solution to a definite volume the extinction of the resulting orange-coloured solution is measured at a wavelength between 470 and 530 $m\mu$. Compounds which yield acetone on oxidation interfere with the determination. A general photometric method for determination of alcohols has been described, making use of the reaction with vanadium 8-hydroxyquinolate, which gives a red complex exhibiting an absorption maximum at 635 $m\mu$.¹⁶ The complex, which is stable for at least 24 hr., is developed by heating a solution of the alcohol in nitrobenzene with the reagent at 70° for 10



Fig. 1. New method for determination of nitrogen. The digestion vessel showing A precollection groove, A₁ digested sample collection groove, A₂ excess waste fluid collection groove, A₃ digestion grooves. From *Annals of N.Y. Acad. Sci.* vol. 87, art. 2, 793.

min., or by allowing a chloroformic solution of the alcohol to stand with the reagent for 3 hr.

Xylenol. The analysis of technical xylenols using a combination of gas chromatography and ultraviolet absorption spectro-photometry has been developed by Belgian workers.¹⁷ Working with a column consisting of 5 metres of Dow Corning Silicone 550, 4 metres of Apiezon L and 1 metre of piccin on firebrick, it was possible to separate and determine phenol, *o*-cresol, 2 : 6-xyleneol, 3 : 5-xyleneol, 2 : 3-xyleneol and 3 : 4-xyleneol. *m*- and *p*-Cresol could not be separated, but were isolated together and determined in cyclohexane solution by a two-point method. 2 : 4-Xyleneol and 2 : 5-xyleneol were similarly isolated together and determined. The coefficient of variation for most of these determinations did not exceed 5%.

Inorganic chemicals

Phosphates. The volumetric determination of ortho-phosphate has been carried out by Cullum and Thomas.¹⁸ The phosphates are converted to the diacid ortho-salt by adjustment of the pH to between 4.5 and 4.6; ammonium nitrate solution is then added (this minimises interference from salts of weak acids such as silicates and borates which may be present), followed by silver nitrate solution. Silver phosphate is precipitated and two equivalents of nitric acid are liberated and titrated with standard sodium hydroxide. The presence of sodium alkylaryl-sulphonates vitiates the determination. A modification of the method may be employed to determine the mean chain length of condensed phosphates. The condensed phosphate is converted to the diacid form and treated as already described; it is also hydrolysed and determined as ortho-phosphate. The ratio of the two titrations gives a measure of the number of phosphorus atoms per molecule.

The reaction between ammonia, hypochlorite and phenol in alkaline medium to form indophenol has been used to determine ammonia by many workers, but the method generally gives poor reproducibility. A critical investigation of conditions has been made by Bolleter, Bushman and Tidwell,¹⁹ who have described a procedure which is rapid, sensitive and gives reproducible and stable coloured solutions. The method is applicable over the concentration

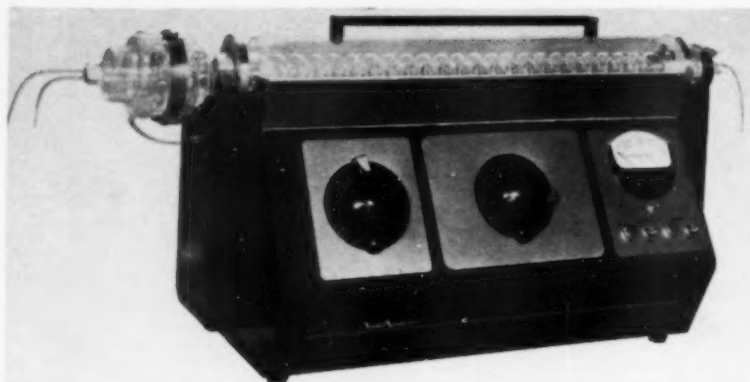


Fig. 2. New method for determination of nitrogen. The digestion module. (Technicon Instruments.)

range 0.3 to 3.0 p.p.m. of ammonia in the final solution, the standard deviation being 0.03 p.p.m. at the 1 p.p.m. level. The reaction is also applicable to substituted anilines. *Para*-substituted derivatives give a blue indophenol, but *ortho*- and *meta*-substituted anilines do not yield a blue reaction product.

The determination of aluminium in the range 0.1 to 0.8 p.p.m. in a final solution of volume 25 ml. has been made by Wetlesen and Omang²⁰ using stilbazo (stilbene-4,4' - bis(1 - azo - 3,4' - dihydroxybenzene) - 2,2' - disulphonate). In the presence of a sodium acetate buffer of pH 5.65 a stable coloured complex exhibiting an absorption maximum at 500 m μ is formed. Anions which will themselves form complexes with aluminium interfere with the reaction, while copper, tin, molybdenum, tungsten, titanium, vanadium and iron all interfere when present in similar concentration to the aluminium.

Drugs and pharmaceuticals

Ergot. The analysis of ergot for alkaloid content has long been a source of disagreement and difficulty. Some of the methods available in official publications do not enjoy the confidence of analysts, although the method of the United States National Formulary has probably commanded the greatest allegiance. Strong and Maurina,²¹ however, found a considerable variation when this method was subjected to collaborative trial. A new procedure has now been presented by Alexander and Baner.²² Total alkaloids are extracted with a mixture of ammonia, methanol and chloroform. For the determination of water-soluble

alkaloids an aliquot of this extract is evaporated and then dissolved in chloroform. The solution is transferred to a column of siliceous earth containing citric acid and water-insoluble alkaloids are eluted with chloroform. The column is then extruded, mixed thoroughly with sodium bicarbonate and then returned quantitatively to the chromatographic tube. Water-soluble alkaloids are then eluted from the column with chloroform. After transference to sulphuric acid solution by conventional techniques the water-soluble alkaloids are determined by the dimethylaminobenzaldehyde method. Total alkaloids may be determined in a separate portion of the ammonia-methanol-chloroform extract by a separator extraction method. Very fair agreement was obtained when the method was applied to two samples of ergot in widely separated laboratories. The new procedure yields higher figures for water-soluble alkaloids than does the current National Formulary method.

Histamine in injection solutions has been determined colorimetrically by coupling with diazotised *p*-aminobenzoic acid in alkaline solution.²³ A straight-line calibration graph is obtained over the range 5 to 100 μ g. of histamine.

A colorimetric method for the determination of microgram quantities of penicillin with an accuracy of $\pm 5\%$ has been developed by Kurzawa and Suszka.²⁴ The method is based upon the induction of a reaction between sodium azide and iodine by penicillamine, resulting from the alkaline hydrolysis of penicillin. A standard quantity of iodine is used and the excess is titrated

with sodium arsenate solution. Results are calculated by reference to a standard curve constructed by hydrolysis and determination of suitable quantities of a standard penicillin solution.

Glycyrrhetic acid²⁵ in liquorice root has been determined by treatment of the extracted acid (about 1.5 mg.) with 1 ml. of ethanol, 0.5 ml. of a 1% ethanolic solution of 2:6-di-*t*-butyl-*p*-cresol and 1 ml. of 20% sodium hydroxide solution. After heating on a boiling-water bath for 30 min. the residue is dissolved in 20 ml. of acetone and the extinction of the resulting solution measured at 575 m μ against a blank.

Sorbic acid can be determined by isolation in steam followed by oxidation with acid dichromate to malonaldehyde and then heating with thiobarbituric acid to give a red solution. The extinction of the resulting solution is measured at 532 m μ .²⁶

Fixed and essential oils

Olive oil. Italian workers²⁷ claim that chemical and physical constants at present in use do not permit an unequivocal judgment of the quality of olive oil. By making use of spectrophotometric measurements at 268 m μ and employing a formula based upon the value obtained and the acidity of the oil, expressed as oleic acid, virgin oils can be differentiated from those which are adulterated or which have been stored or handled in an unsatisfactory manner. Virgin and refined olive oils may be differentiated by the determination of alkaline impurities.²⁸ Two methods have been proposed for such determinations, the first based on titration with very dilute acid to bromophenol blue, and the second on conductivity measurements in acetone solution.

Citronellol and geraniol. The determination of citronellol and geraniol in essential oils has received considerable attention in recent years. Van Os and Elema have stated that cold formylation cannot be used for the determination of citronellol, since geraniol also gives a formate.²⁹ By carrying out a preliminary dehydration of the geraniol, however, they claim satisfactory results for citronellol by using a method of acetylation in pyridine. The dehydration is carried out by distillation of an azeotropic mixture from the oil, toluene-*p*-sulphonic acid and xylene. Water

separates in a side-tube and the xylene solution returns to the distillation flask. After drying the xylene solution with anhydrous magnesium sulphate the citronellol is determined by acetylation in pyridine.³⁰

Holness³¹ has investigated the hot formylation reaction with the aid of gas chromatographic studies of the reaction products and he has shown that several important side-reactions occur which cannot be eliminated by any modification of reaction conditions. For certain proportions of citronellol and geraniol it is possible to use conditions which give an apparently correct result, but these same conditions would give incorrect results for other blends. The author concludes that the method of hot formylation could not be made the basis of an accurate and generally applicable determination of citronellol in admixture with geraniol, no matter what changes in working conditions were employed.

Steroids

The Porter-Silber reaction for 17,21-dihydroxy-20-oxosteroids has been extended to 17-deoxy- α -ketolic steroids by carrying out a preliminary oxidation with cupric acetate.³² The technique has been applied to the quantitative micro-determination of the ketols themselves and to their detection on paper chromatograms.

A rapid colorimetric assay for diosgenin, an important starting material in the synthesis of many corticosteroids, is based on treatment with 70% perchloric acid.³³ This gives an immediate yellow colour with an absorption maximum at 410 m μ . Certain related compounds which occur naturally with diosgenin give a similar reaction, so that results are usually higher than those obtained by a chromatographic procedure. For routine inspection, however, the method is of value because it can be completed in 30 min. compared with 8 hr. for the separation method.

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Chemical catalogue. A new general chemicals catalogue has been issued by Albright and Wilson (Mfg.) Ltd. An insert section shows the way in which these chemicals are used throughout British industry in the production of a multitude of industrial and consumer products in everyday use. Close on 350 products are listed in the catalogue, which is neatly designed for ready reference in a bold alphabetical form.

Waxes. Glokem waxes are wax-like materials of uniform quality developed to cover a wide range of new uses in industry for which natural waxes are generally not suited. Glovers (Chemicals) Ltd. have issued a booklet on Glokem waxes which gives a lot of information on their uses.

COSMETICS and Toilet Preparations

By W. W. Myddleton, D.S.C.

Silicones in barrier creams • Peroxides in anhydrous lanolin; occurrence and significance • Peroxides in solvent ethers • Colour additives in cosmetics

Silicone barrier creams

SILICONES have long been known as valuable barrier agents. They form a barrier film on the skin which is water-repellent over a wide range of working conditions, at the same time permitting the free passage of water vapour so that hydration of the stratum corneum is not appreciably increased as is the case when the barrier agent is a vegetable or mineral oil, or a long chain fatty alcohol or acid.

It is not always fully appreciated that the choice of emulsifying agent may profoundly affect the performance of the barrier cream containing the silicone. A report has recently been made on the subject.¹ The authors summarise the properties of a desirable emulsifying agent as follows:

- a It should form a stable and elegant emulsion;
- b It should be neutral in reaction;
- c It should be unlikely to affect keratin chemically;
- d It should have low skin penetration;
- e It should be unlikely to act as a sensitising agent;
- f It should produce a cream which is non-slippery, non-tacky and with low transfer to handled materials such as paper.

The authors find that methyl cellulose possesses all these desirable characteristics and recommend a formulation which has added advantage of employing only official B.P.C. materials.

Barrier Cream

Dimethicone 20 B.P.C. . .	30%
Methylcellulose 20 B.P.C. . .	4%
Preservative	q.s.
Water	ad 100%

Preservatives recommended are

a mixture of 0.12% methyl-*p*-hydroxy benzoate, B.P.C., and propyl-*p*-hydroxy benzoate, B.P.C. 0.03%. Also effective is 0.5% 2-phenyl ethanol.

The resulting barrier cream is described as pharmaceutically elegant and it is quite probable that with a few modifications it might be made into an attractive cosmetic preparation.

Peroxides in anhydrous lanolin

It is not generally realised that peroxides in cosmetic materials can trigger off oxidative processes which lead to instability with breakdown of emulsions and the development of undesirable odours and discoloration. Seemingly innocuous materials as beeswax and lanolin may offend in this way.

A recent investigation² has shown that lanolin on the fleece has a significant peroxide value brought about by autoxidation. In the process of recovery the peroxide value falls, but if the bleaching operation involves the use of oxidising agents it rises again. A lanolin bleached by other means will initially have a low peroxide value, but this may increase in the surface layer in contact with air. This form of oxidation is accompanied by large changes in acidity, unsaponifiable matter and cholesterol content. On the other hand, the peroxides formed by chemical bleaching are not accompanied by these undesirable manifestations and it is clear that peroxides themselves are not responsible but their decomposition products. The peroxides of chemical bleaching are distributed throughout the mass of the lanolin and not merely upon the surface, so that it becomes important to determine whether the peroxides in a given sample are distributed throughout

the lanolin or are concentrated upon the surface.

Reference is made in the report to the poor shelf life of a penicillin ointment prepared with a lanolin of high peroxide value.³

There is little doubt that the presence of peroxides, however formed, in beeswax and in lanolin will initiate oxidative deterioration in the surface layers of cosmetic preparations containing materials susceptible to this kind of deterioration.

Peroxides in solvent ethers

Diethyl ether may contain peroxides after storage for some time under unfavourable conditions. Its use as a solvent or as a precipitant for readily oxidisable substances sometimes leads to the formation of highly toxic products in pharmaceutical preparations. The major hazard for the cosmetic chemist is the formation of a highly explosive ethylidene peroxide which detonates in the final stages of distillation for recovery of the ether.

The working losses involved in the use of diethyl ether have led to the use of the less volatile isopropyl ether which, however, is more susceptible to peroxide formation. Greater care must therefore be taken to remove any existing peroxides and to stabilise the peroxide-free solvent. The peroxides from isopropyl ether are dangerously explosive and serious accidents have been reported during recovery by distillation.

The development of peroxides in the ethers in general is accelerated by contact with iron and by the presence of aldehydes and a number of other organic compounds. It can be retarded by adding a small amount of a suitable alkanolamine or alkylamine or other amino derivative, for example 300 p.p.m. of morpholine, 50 p.p.m. diethylene-triamine or triethylene-tetramine, or 16 p.p.m. of *N*-benzyl-*p*-amino phenol.

The conditions affecting the stability of isopropyl ether have been studied recently.⁴ The ether containing one of these inhibitors can be stored satisfactorily for long periods in well-filled iron cans. The inhibited ether contained 2 mg. equivalent of peroxide oxygen per gram of ether after storage for over 1,000 days in an iron can, and in an iron can coated internally with a baked phenolic resin contained 0.75 mg. equivalent peroxide oxygen per gram

after 400 days. Deterioration was greatest in clear glass containers in daylight when 6 mg. equivalents peroxide oxygen developed in 550 days.

The authors report that peroxides can be extracted by shaking with caustic soda solution. The time-honoured method of drying diethyl ether in Winchester quart lots by introducing freshly extruded sodium wire serves at the same time to keep the ether free from peroxides, and the same procedure can be used for preserving small volumes of isopropyl ether, preferably in glass bottles stored in the dark.

Colours for cosmetics

In recent years considerable discussion has taken place as to the safety of many colours which have been used for foods, drugs and cosmetics for years. The discussions have centred in America where, since the passage of the Food, Drug and Cosmetic Act of 1938, a number of coal tar colours have been approved and listed for use in three different categories. The first group is approved for use in food, drugs and cosmetics and designated by "FD&C"; the second, "D&C," is approved for drugs and cosmetics for application to any surface of the body, including surfaces covered by mucous membrane but excluding the eye. The third group, "Ext. D&C," includes colours approved for application to the body surface, excluding the lips and other skin surfaces covered by mucous membrane as well as the eye area.

The Act specifically states that any colour approved must be harmless under the conditions of application covered by the category to which the dye is assigned. Here it was tacitly assumed that a coal tar colour which has been in use for years without untoward incident might be considered harmless, so long as specified standards of purity are complied with. Under the terms of the act each batch of dye must receive official certification after analysis by government authorities. The standard requirements for all approved colours have been published from time to time.

In 1950 doubts were thrown upon the wisdom of continuing these criteria of harmlessness. As a consequence of a rather heavy dose of a listed and certified orange colour being used in the manufacture of a toffee a boy became ill and undesirable physiological reactions were

attributed to the dyestuff itself. This led to a pharmacological examination of other certified coal tar colours which revealed that some of the colours had undesirable effects in animal feeding investigations and could not therefore be considered to be harmless even though in normal usage in cosmetics the amounts and methods of application were such that no harm could be demonstrated. The conclusion of the F.D.A. was that such colours could not be used at all in the categories "FD&C" and "D&C." This decision was upheld in the Supreme Court in 1958.

A number of coal tar colours, some of great value in the manufacture of lipsticks, were therefore about to be condemned for this purpose because, at dosages extravagantly larger than any quantity which might be ingested from the lipstick, they killed animals. Recent changes in the law now permit the setting up of tolerances so that the disputed colours may be employed in their particular category in limited quantity. For two and a half years from July 1960 provisional tolerances have been specified by the Administration, and it is understood that at or before the end of this period permanent tolerance limits will be established on the basis of experiment. In the meantime the limits for lipstick colours in the cases under dispute, namely "not more than 6% by weight in each lipstick," is satisfactory to the manufacturer.

Colour additives defined

A new matter raised by recent legislation is the definition of a "colour additive" as "any substance which, when added to a food, drug or cosmetic, or to the human body or any part thereof, is capable (alone or through reaction with other substance) of imparting a colour thereto."

In application to the human body "colour" includes black and white and intermediate greys and "additive" includes all diluents. The latest legislation deals with "colour additives in food, drugs and cosmetics" and therefore brings within the scope of the regulations many substances which were formerly unrestricted. Natural and synthetic colouring agents such as cochineal and the copper chlorophyllins and organic compounds which develop colour when applied to the skin such as alloxan and dihydroxy acetone are now in the list of colour

additives "on the basis of prior commercial sale but which have not (hitherto?) been subject to certification." On the same grounds many inorganic colour additives have found their way into the permitted list including aluminium, bronze, copper and gold powders, along with bentonite, calcium carbonate, some carbon blacks, chromium oxide, kaolin, talc and titanium dioxide.

This may be taken as evidence that these commonly used materials will now come under close scrutiny and pharmacological testing and will be subject to official standards. Many substances in this list have already been reviewed by the Standards Group of the Toilet Goods Association of America and by the Toilet Preparations Federation of the United Kingdom, and these bodies have issued specifications and details of methods of testing. What is lacking at the moment is a background of toxicological and pharmacological study and no doubt this will be demanded soon.

The British cosmetic industry is as much concerned, although indirectly, as the American with the legislation affecting the use of colour additives and both are as anxious as the F.D.A. to safeguard the public. It is clear that these investigations will be pursued intensively on both sides of the Atlantic.

Drastic action has already been taken this year by the U.S. Department of Health, Education and Welfare in the case of the water-soluble colouring matter Ponceau 3R which was listed as FD&C Red No. 1, a coal tar colour commonly used for foodstuffs, drinks and drugs. The action was taken when it was found that extensive liver damage resulted when the dye was administered in the food of test animals. The dye is now relegated to the lower division as Ext. D&C Red No. 15. As far as the cosmetic industry is concerned this is not a very serious matter, the only effect being that it cannot be used to colour oral preparations such as toothpastes and mouthwashes. It is not employed in the manufacture of lipsticks.

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THE SCENT OF FLOWERS AND LEAVES *A Search for Fragrance among the Minor Natural Orders*

By Edward S. Maurer, F.L.S., M.R.I.

6. The Goose-foot Family (*Chenopodiaceæ*)

This family includes wormseed, the source of the anthelmintic oil, and the spinach group. The odours are mainly unpleasant, but Mr. Maurer thinks that some might be developed as fixatives. In his previous articles Mr. Maurer discussed bindweeds (January), arum lilies (February), primroses and cyclamens (March), borage (April), and snapdragons (June).

AT first sight this family may be regarded as a minor order but, surprisingly, it comprises some 75 genera and upwards of 550 species, mostly common weeds with non-descript colourless flowers, abounding in temperate regions and frequenting sand dunes, sea marshes and old lake bottoms, the foliage being impregnated with salts of sodium, magnesium, potash and calcium.

Plants growing in such a habitat are termed halophytes, among which we may note (for their unique astringent properties) the *Salaolas* or salt-worts; the *Suedas*, the Maritime or Sea-blite; the *Salicornias* and *Samphires* or glass-worts, which at one time were harvested in some coastal areas and incinerated for their valuable alkaline ashes.

This is one of those families, mostly weeds, in which there is no immediate evidence of any sweet-scented proclivity, and nothing of interest for the garden lover. But when the order is surveyed several potential items emerge, for instance the strongly aromatic foliage of some species and the nauseating maleolents of others. The persistency of many of these herbal malodours suggests their potential usage as perfume fixatives.

The etymology is elementary for in the Greek *chen* signifies a goose and *pous* a foot, which describes the characteristic shape of the leaves. In passing we may note that this family offers such items of economic importance as the sugar-beet, mangold-wurzel and spinach, while in the Near East there are a number of succulent vegetables and fruits which have unusual and piquant tastes and odours. We may also note

that although there are several useful medicinal glucosides there does not appear to be anything noxious or harmful in the family. According to some authorities *Salvadora Persica* is the mustard-tree of Scripture; it bears a juicy fruit having the flavour of cress and remarkable for its microscopic seeds.

The genus *Chenopodium*

Commercially, the most important is *Chenopodium ambrosioides* var. *anthelminticum*, commonly known as American wormseed and variously as Mexican goosefoot, Texas tea, Demigog's-food or Californian spearmint. The oil expressed from the seeds is mentioned in most pharmacopœias as an anthelmintic (i.e. an expellant of intestinal worms) and owes its activity to the presence of ascaridole (Greek *askaris*, a parasitic worm). This is one of the few naturally occurring dioxides, the essential oil texts remarking that when the oil is treated with a solution of ferrous sulphate it decomposes with explosive violence.

The odour of the oil is peculiar and characteristic, and although it has been likened to that of a liaison between camphor and terebene, I find this inadequate, and I think after smelling them side by side that there is a close affinity with the odour of parsnips and tansy.

In the botanic-medical texts some further 20 species are mentioned, among which is *C. bonus-Henricus* with an age-old reputation as a prophylactic against the marsh fevers of low-lying lands. It is still known by such names as Good King Henry, the false or wild mercury and wild spinach. I find that the freshly

bruised foliage has a persistent balsamic camphoric scent which is much more aromatic in the leaves of the E. African *C. botrys*, known locally as the cat-leaf goose-foot, and also in *C. quinoa* which is the petty-rice or fever-herb of Peru.

C. album is the common or white goose-foot, the piquant leaves and seeds of which were extensively used at one time as a rural pot herb.

The malodorants

Of the species with unpleasant odours we may first note *C. vulvaria*, also known as *C. olidum*, and expressively named stinking goose-foot. From the chemical viewpoint it is of interest to note that olidness is due to the presence of trimethyl amine which smells like herring brine. I have noticed, however, that on crushing the foliage the initial smell is similar to that of another species, namely *C. garosmus*, i.e. shrimp-like, but this soon changes to the nasty effluvia of putrid fish.

This piscine odour in a more diluted form is incidental to the early blossoms of the hawthorn, mountain ash, the pear and sweet chestnut, and in particular in the pale lilac flowers of *Boussingaultia baselloides*, the Madeira mignonette-vine. *C. amaranticolor*, a giant species growing upwards of 7 ft., bears foliage which has a brownish-purple pigment on the undersides of the leaves which rubs off on the fingers and impregnates them for hours with a stale aminic odour resembling cockroaches. Another foul-smelling species is the *Cori/spermum*s, the literal Greek meaning bug-seed.

It may be incongruous for the perfumer to think of fishy odours,

yet I have noticed that traces considerably improve the nuance of rectified cade and birch-bark oils, while a little preliminary work on using oil of chenopodium as a solvent for indole, skatole and phenylacetic acid leads to some interesting conclusions.

The spinach group

The genus *Spinacia oleracea* is our familiar garden spinach. The name would appear to have been derived from the early usage of a similar herb called by the Persians *esfina*, and used by them as an antiscorbutic. The therapeutic action is due to spinetin, which like asparagin has an amino-succinic background.

Sundry species of *C. auricomum*, *C. erosum* and *Tetragonia* are the Australian spinaches; *Blitum capitum* is the N. American spinach bearing strawberry-like fruit; *Atriplex* the mountain spinach; and so on through a dozen or so varieties, which according to locality are used as salad adjuncts.

Some fragrance of a balsamic-resinous character is reported for the foliage of the S. African *Gannas*, *Cheolas* and *Aniscanthas* and the N. American *Cyclomas* and *Kochias* (Belvedere Cypresses).

Conclusion

The material offered from a survey of this weedy yet potentially interesting family may perhaps best be described as tentative, i.e. work done experimentally and entered in the perfumer's commonplace book for further attention.

FLOWER-BASED SUNBURN CREAM

Skin-treating compositions, particularly for preventing or curing sunburn, are prepared by mixing an aqueous extract of marigolds with tincture of benzoin, tincture of myrrh and the usual constituents. Example: An aqueous extract of marigolds is mixed with about 10% of glycerol, 1.5 to 2% triethanolamine and traces of borax, heated to 70° to 90°C., and emulsified with a melt of stearin and coconut oil, preferably in a ratio of 1:1, and preferably small amounts of beeswax and/or adeps lanæ anhydricum and/or spermaceti; the meli is separately heated to 60° to 80°C. and mixed with traces of thymol. 1 to 1.5% of tincture of benzoin and 0.5 to 1% of tincture of myrrh are added. (Austrian Pat. Appln. A. 1,162/57.)

More push-button packs

Two products, *Min Spray* furniture polish, in a decorated 6 oz. tinplate pressure container, and *Chandau* hair lacquer, in a 6 oz. aerosol container, are newcomers to the range of push-button packs supplied by Metal Box. The polish pack is specially lacquered internally to prevent corrosion and is fitted with a break-up spray precision valve. The lacquer pack is plain internally and fitted with a precision valve protected by a white plastic dust cover.

A new pharmaceutical aerosol product *Footone* conditioner for tired feet, is packed in a pressure container by Metal Box. The pack, fitted with precision valve, is decorated in three colours by offset lithography.

Iron mould remover in polythene tubes

Drummer Movel iron mould remover, made by William Edge and Sons Ltd., is packed in a blow-moulded polythene tube supplied by Metal Box Co.

These translucent low density polythene tubes measure approximately 4½ in. × ¾ in. diameter and are fitted with a polythene dropper for controlled application, as well as a white polystyrene screw cap. The tubes are silk screen printed in black.

Glass chosen for new wave set

County Laboratories' improved *Amami Wave Set* is packed in a newly designed gently contoured clear glass bottle. Label and closure are black, with a two-colour label contrasting with the green of the product.

The bottle, which tapers up from an elliptical base to a deep-skirted plastics screw cap, is supplied by United Glass Bottle Manufacturers Ltd.

Strip-seal pastilles

Crystallised throat pastilles have been packed in sealed strips for the first time in Britain by Meggeson and Co. Ltd. Strips protect the pastilles better and weigh less than boxes. German Wolkogon HV machines are being used to pack them. These machines accommodate contents from 3-16 mm. thickness and 7-30 mm. diameter with an output of 80-320 tablets a minute.

Bubbles stick to untreated surfaces

A new type of plastic bubble packaging—a bubble with heat-seal adhesive pre-treated to its flanges—has been developed by Gordon and Gotch Ltd. It is believed to be the first of its kind in the world.

The new bubbles can be stuck to cards which have not been previously coated with a heat-sealing adhesive and the makers claim the bond is stronger than a seal made between untreated flanges and a coated card.

Packaging



Left: New bottle design by U.G.B. Right: Blow moulded polythene tubes by Metal Box.

Treated bubbles will adhere to cartons, showcards and advertising displays, and to all types of printed materials, and extra tenacity allows it to hold heavier contents.

Offset printers

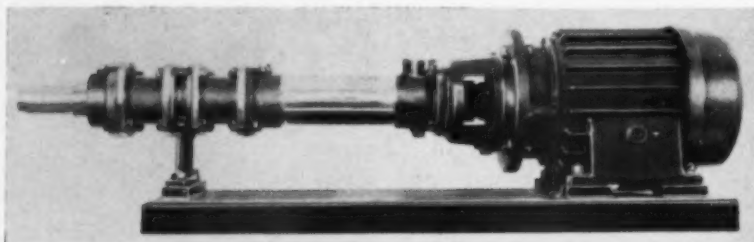
Rejafix Ltd. is to market printing machines hitherto not obtainable here. They include reasonably priced multi-colour offset printing machines for printing and decorating bottles, tubes, plastic lids, etc., and one and two colour silk screen printing machines for oval, flat and cylindrical polythene bottles, etc. These machines are universal and with various attachments can be made to cover a variety of differently shaped articles for automatic production with interesting output figures. The machines will be shown at the Packaging Exhibition, London, September 5-15.

Paperboard, solid and corrugated board

Thames Board Mills have extended the use of white and coloured linings to give a brighter and more compelling appearance to the printed design of the *Fiberite* packing cases, made from solid and corrugated board. The latest development is the white lined case with the all-over *Fiberite* grained pattern as background for one or two-colour printing.

Thames Board, the trade name for various grades of paperboard, covers grades ranging from solid white, coated white and white lined folding boards to chipboards and strawboards. *Aquapruft* wet-strength board is made for humid climate use.

Plant and Equipment



Production homogeniser by Ultrasonics Ltd. has a throughput of 300 gal. per hr.

►PIPE INSULATION

A new improved pipe insulation material designed to reduce installation costs and for use for hot, cold and low pressure steam working is being marketed by Semtex Ltd.

Lightweight, durable and flexible, *Foamflex* is available in lengths of 9 ft. 9 in. It is off-white in colour and is made in sizes to fit pipes of the following nominal cores:

$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$ and 4 in.

Foamflex can be fitted quickly. The sections are supplied slit longitudinally down one side, and are slipped over the pipe, the joints being sealed with a special adhesive.

The flexibility of the insulation enables it to be carried around slow bends and the material is easily cut to fit bends with sharp internal radii, "T" junctions, etc. No special fittings are necessary.

Overpainting is not necessary under conditions of normal hot and cold working.

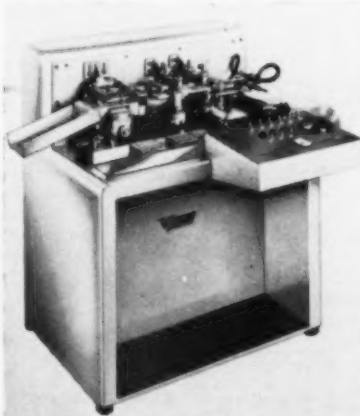
►ULTRASONIC MIXER

Ultrasonics Ltd. have introduced the *Dispersonic*, another of their ultrasonic homogenising and dispersing units based on the patented principle of the liquid whistle. The *Dispersonic* has been specially designed for the high-speed dispersion of powders in liquids. It is claimed that with it emulsions containing solids which would rapidly wear out conventional equipment can efficiently be produced.

In the *Dispersonic* rough mixes of powders in liquids or emulsions are passed in a thin stream at high velocity across a blade which is thus caused to vibrate at its natural frequency of 18-22 kc/s. Cavitation is induced and extremely high localised pressures applied within the liquid stream, without the loss of

energy which normally occurs in transfer from one medium to another. The unit consists of the vibrating element and an integral pumping unit driven by a direct coupled 3 h.p. motor. All stainless steel construction permits high standards of hygiene. Mounted on a steel baseplate, it takes up only 5 sq. ft. of floor space.

A wide variety of powders such as carbon black, colloidal clay, titanium dioxide or antibiotics can be rapidly dispersed. Difficult emulsions incorporating powders can be made with a very fine particle size and throughput is very high for a machine of only 3 h.p., being approximately 5 gal. per min. Highly abrasion resistant materials are used to give long life and there is no aeration of the product, nor is there any heating effect.



This packing machine—type W.E.P., made by H. Strunck and Co., of Cologne, can pack bundles of square folding containers in cellophane. Bundles ranging from 60×50×25 mm. up to 160×160×60 mm. can be produced. Capacity of the machine depends on the size of the container and the packing material. Throughput is about 1,200 packages per hour.

►PACKAGING MACHINES

At the International Packaging Exhibition Newman Labelling Machines Ltd. are exhibiting and demonstrating the following machines:

Labellers: *Model 24A*, strip gumming labelling machine, a larger version of the 23A machine, of which more than a thousand models have now been sold. The 24A machine handles labels up to 5½ in. high by 6¾ in. wide. Maximum speed: 40 per min. *Model 3C*, all over gumming labelling machine, particularly suitable for applying labels to flat surfaces. Maximum speed: 40 per min. *Model 6B*, automatic labelling machine for cylindrical objects, a special version of the 2B machine with an increased speed ramp up to 60 labelling operations per min. A speed variator is fitted.

Gumming Machines: *Model 1D*, a self-feeding label gumming machine which gums and dispenses labels by depressing a touch bar. It accepts labels up to 6 in.×12 in. at any speed. An attachment allows hand feeding singly, which is practical for longer or odd sized labels and also for small runs. *Model 2D*, a slower version of 1D with a more positive feed, which allows thicker and consequently tackier adhesives to be used.

Printing Machines: *Model 1F* prints by double offset impression cylindrical objects up to 1½ in. diameter. Ideally suited for use of quick drying ink, it is suitable for plastic and metal containers as well as glass vials and ampoules. Speed: up to 100 per min. ARBIS/5FO, an Italian manufactured silk screen printing machine for cylindrical objects, complete with firing-in oven. Suited for permanent printing of ampoules, vials and glass tubes. Compact and efficient, it prints and fires ampoules up to 10 c.c. at a speed of 37 per min.

►MICROSCOPY REFERENCE FINDER

The England Finder has been designed to provide an accurate reference system whereby the user of a microscope and slide-mounted specimens can easily and quickly find the field of interest. It consists of a glass slide, 3 in.×1 in. marked with a square grid at 1 mm. intervals. Each square contains a centre ring bearing a reference letter and num-

ber, the remainder of the square being subdivided under four segments, numbered 1 to 4. Reference numbers run horizontally (1 to 75) and the letters (A to Z but omitting I), run vertically. The main locating edge is the bottom of the slide which is used in conjunction with either the left or right vertical edge of the slide, according to the fixed stop of the stage of the microscope, all three locating edges being marked with arrow heads.

To use the Finder the specimen slide is marked with a label, on the left, indicating with arrows which sides are to be used for location. The slide is then placed on the stage of the microscope and the bottom long edge is brought into contact with the base stops of the stage and then slid either to the left or right, into contact with the vertical fixed stops, as necessary.

After examining the specimen in the normal way and finding a point of interest it is brought to the centre of the field of view. Then, taking care not to alter the position of the fixed stops of the stage, the slide is removed and replaced by the Finder, again bringing the bottom edge in contact first and sliding to the appropriate vertical stop, the label of the Finder being at the bottom left corner. The reference pattern of the Finder can be seen through the microscope, and the reference number of the main square recorded, followed by an oblique stroke and the number of the segment in which the centre of the field of view lies.

►SPRAY CLEANING SYSTEMS

Diversey (U.K.) Ltd. manufacture two special spray cleaning systems called the Shurspra and Transpray systems. Both rely on stationary, stainless steel spray heads; the equipment can be fixed or portable and can be used for the cleaning of processing vats, evaporators, storage tanks, bulk transport tankers, etc. With these systems, powerful jets of cleaning fluid are directed to every part of the interior surfaces of the vessel to be cleaned. It is claimed that the simplicity of these units virtually eliminates maintenance, since there are no moving parts and nothing to wear out. For cleaning road and rail tankers, for instance, it is claimed that one operator, using the Transpray, can do the work in 10 min.; manual scrubbing in confined spaces is eliminated and the cost of materials is reduced, since solutions can be re-used.

►MAGNETIC DIPSTICK

The level of liquids in containers can be found very easily by means of a dipstick, but this simple device is not normally applicable to the closed containers needed for toxic or volatile liquids, or for liquids stored under pressure. An extension of the dipstick technique to such containers, is, however, offered by a new device.

A tube is sealed into the container, with an open upper end accessible from the outside, and a closed lower end below liquid level. A ring magnet encircles the tube, being carried on a float so that its level marks that of the liquid surface. A dipstick having a small magnet at its lower end can be inserted into the open end of the tube, and mutual attraction between the magnets ensures that the liquid level will be readable on the calibrated stick.

An interesting feature is that the device can be installed upside down, so that levels can be found by inserting the dipstick from the bottom of the container.

►LOOKING THROUGH KEYHOLES

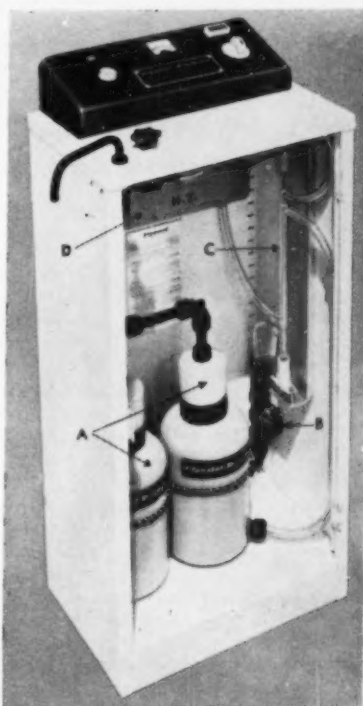
A miniature optical inspection device has been marketed primarily for inspecting the inside of locks and padlocks through the keyhole. There should be many industrial and laboratory applications in which it can usefully be applied.

The probe is $\frac{7}{16}$ in. diameter and 2 in. long. It contains a miniature lamp and an interchangeable mirror head. By choice of the appropriate head, and rotation or tilting of the tool, complete coverage of the interior under inspection can be ensured.

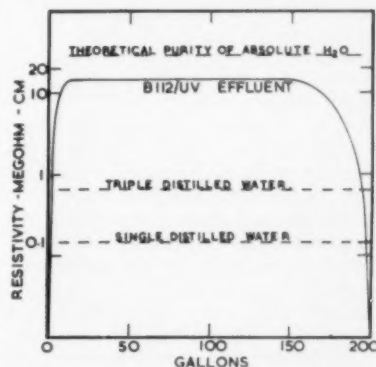
►DEIONISER PLUS U.V. STERILISER

The Elgastat B.112/U.V. mixed bed deioniser with U.V. steriliser provides purified water B.P., ultra pure water, and sterile deionised water. To prevent any organisms entering the system, the tap water first passes through an ultra-violet tube. From there it is guided through two mixed bed ion exchange cartridges. The deionised effluent passes through a second channel in the U.V. tube to the draw-off point. A conductivity meter indicates effluent quality throughout usage. Effluent purity is consistent at a minimum of 10 megohm-cm. For sterile effluent, the U.V. lamp is switched on and a panel signal confirms its operation.

Flow rate is up to 250 litres per hr. No regeneration *in situ* is essential; the world-wide Elgastat cartridge service applies to this deioniser.



Elga Products' new deioniser combined with an ultra-violet steriliser. Flow rate is 250 litres per hr.



This graph compares the purity of water produced by the new Elgastat deioniser with distilled water.

Yield between cartridge exchanges depends upon the dissolved solids in the raw water; in hard water areas some 400 litres may be drawn, in soft water areas up to 4,000 litres of sterile deionised effluent are available between cartridge exchanges. To maintain sterility, the draw-off pipe is removable for sterilising. The unit is fully mobile on castors and measures 42 in. × 18 in. × 13 in. Price £150. Made and supplied by Elga Products Ltd.

American Commentary

NEWS AND VIEWS OF THE U.S. PHARMACEUTICAL INDUSTRY by Dr. Rudolf Seiden

*Kefauver's onslaught ★ Steroid potency criticism ★ Compulsory testing of cosmetics proposed ★ Toxicity of fats
Boom in drug and toiletry sales*

IN A 374-page report, Senator Kefauver's Committee indicted the whole pharmaceutical industry, claiming it makes too big profits while they should be "expected to be relatively smaller" than those of other industries. Comparative tables and charts inform us that only the U.S., Panama, and Belgium permit patents for drug products without imposing any limitations and "safeguards" for the public welfare. But in a minority report of 183 pages, Senators Dirksen and Hruska say that only new drugs, for which no substitute therapy exists, are relatively higher-priced than other goods. This is so because of the tremendous risks of the drug industry whose expenses of well-trained staff are much higher than "plant-costs" of other industries.

Here are a few quotes from the minority report: "... The Soviet Union, in which the profit motive does not exist and in which the drug industry is completely regulated, produced no single new drug since the communist revolution ..."

"From 1939 to 1958 the American pharmaceutical industry's production grew 8-fold ... In 1958 it amounted to \$2,591 million ..."

"Before the second world war we exported only \$10 million worth of drugs a year and we imported over \$20 million worth. We now export more than \$284 million worth of drug products a year."

"While wages increased 70% between 1948 and 1958 and construction costs by 64%, the increase in the wholesale drug price was only 3% ..."

"More than 1300 companies are engaged in the manufacturing of prescription drugs—with no one company accounting for as much as 10% of the total sales ..."

As to the statement about patents for drug products, the minority report supplements the majority report by outlining that:

"... of 77 countries for which information has been obtained, only 28 grant product patents in the pharmaceutical field. And some of these 28 specifically exclude patents

on combination drugs ... Others limit the protection to products prepared by means of the process revealed by the patent holder, while still others contain compulsory licensing requirements;" (e.g. Australia, Canada, Great Britain, and India).

In addition to these 2 congressional reports, there is now available a 172-page report by the Pharmaceutical Manufacturers Association which discusses the industry's pricing methods, generic names, congressional investigations, Government policies, etc.

Potency of steroids

The Medical Letter (3, 58-9) says that one of the so-called "big differences" among the various steroids is their milligram potency—yet it has no clinical significance. The equivalent doses of a number of corticosteroids are given as follows: Cortisone 25 mg.; hydrocortisone, 20 mg.; prednisone, 5 mg.; prednisolone, 5 mg.; methylprednisolone, 4 mg.; triamcinolone, 4 mg.; paramethasone, 2 mg.; dexamethasone, 0.75 mg.; and betamethasone, 0.6 mg. Some of these drugs "have shown severe side effects"; and it is "doubtful that therapeutic resources are particularly enriched by proliferation of corticosteroids differing mainly in milligram potency."

Cosmetic control la. coming

The Food and Drug Administration is now preparing legislation for pre-market testing of cosmetics.

Recently a number of eye-pencils and other eye-make-up products were checked for compliance with regulations which forbid the use of coal-tar colours in eye products; and a short while ago, the FDA concentrated on checking lipsticks for the content of any uncertified coal-tar colours.

The Toilet Goods Association set up a large trust fund to supervise an all-industry testing programme of the following 13 lipstick and 11 other external coal-tar colours for use in cosmetics:

(a) FD&C Blue 1; Reds, 2, 3 and

4; Yellows 5 and 6; Green 3; Violet 1.

(b) D&C Oranges 4, 5, 10 and 17; Reds 7, 9, 10, 18, 19, 21, 24, 27 and 36; Black 1; Brown 1; Yellow 7. (In addition, 13 food colours are now being tested in the laboratories of the FDA and 7 other colours have been selected for testing by the Pharmaceutical Manufacturers Association.)

Toxic products in fats

A drum of fatty acid intended for use in the manufacture of human food additives has been seized by the FDA on charges that it contains material toxic to chickens which were used as test animals.

Three years ago, when several million chickens died after eating residues from commercial fat processing in poultry feed, a special assay was developed to check foods and feeds for the toxic component, which is referred to as the "chick-edema factor."

The fat recently seized was tested by this method and was found to be free of the chick-edema factor. However, a new test conducted in FDA laboratories has revealed another factor which proved to be toxic to chicks, but not to rats.

Fats and fat by-products for food and feeds are being intensively examined by the FDA to determine the chemical changes that take place through prolonged heating (such as occurs in deep fat drying) or through industrial processes.

Drug and toiletries sales up

Americans spent last year \$5,222,820,000 on drugs and other health aids—8.5% more than in 1959. A similar substantial increase was recorded in the retail sales of toiletries, which rose to \$3,296,350,000—6% above the 1959 retail level.

The biggest sellers in 1960, in million dollars were: Prescriptions \$2,175.4; Vitamins 158.6; Aspirin and compounds 123.3; Reducing preparations 104.3; Cough syrups 67.8; Tonics 60.9; Tooth pastes 57.1; Infant formulas 50.6; Shampoos 42.6 and Deodorants 40.0.

Chemistry of Carbon Compounds

Edited by E. H. Rodd. Vol. 4c. Heterocyclic Compounds. Elsevier. 1961. Pp. 2,201. 130s. net.

PROF. RODD's prodigious work moves a step nearer completion with this book, which concludes the survey of heterocyclic compounds started by vol. 4. The account of compounds with two hetero atoms in a six membered ring is continued with a description of oxazines, thiazines and dioxo compounds with their sulphur analogues, followed by an account of the colouring matters derived from phenazine, phenoxazine and phenothiazine. The book includes six membered rings containing more than two hetero atoms and more complex ring systems including the purines, pteridines and alloxazines. Vitamins B₁ and B₂ are described in the alloxazine section. The book concludes with seven chapters devoted to a description of alkaloids—their occurrence, properties, synthesis, constitution and stereochemistry.

This volume fully lives up to the scrupulous standards set by its predecessors which together make a modern and monumental treatise on the carbon compounds such as is unlikely to be seen again for a generation.

Wachs-Enzyklopadie

By L. Ivanovszky. Vol. 2. Part 1. Verlag für chemische Industrie H. Zolnowsky, Augsburg. 1961. Pp. 486.

THIS second volume of Dr. Ivanovszky's book covers the examination of waxes and related products such as paints, fats, adhesives, mineral oil products, oils and soaps. The first part of the book introduces the reader to the subject, the second deals with standards for waxes and wax products, the third covers physical and chemical examinations, the fourth basic principles of analysis, the fifth and sixth thermal properties, and the seventh and eighth mechanical properties.

This book, comprehensive and wide ranging as it is, is only the first part of volume 2 of Dr. Ivanovszky's monumental work. Part 2 will cover further physical and chemical properties of waxes, and part 3 chemical and physical analysis. Then we are promised two more volumes: Pro-

duction of Waxes, and Properties and Utilisation of Waxes. Volume 1, Waxes and their Most Important Properties, itself in two parts, has already appeared.

When the Wax Encyclopædia finally emerges as a complete work there will be very little left to say on the subject.

Modern Science Dictionary

Compiled by A. Hechtlinger. Chatto and Windus. 1961. Pp. 559. 25s. net.

THIS is a book to give to someone in the upper class of school or technical college to help him understand technological terms outside his immediate studies. The ground covered includes aeronautics, astronomy, biology, chemistry, geology, meteorology and physics, and numbers some 16,000 entries. Inevitably entries are brief to the point of breathlessness, and they would have been of more use with the addition of diagrams, illustrations and linking references.

The express intention of the dictionary is to assist the layman and the student unfamiliar with scientific terms, and as it is successful within the limits thus imposed, it is carping to take it to task on purely technical matters. However, some of the entries are of dubious worth even to a layman, and one could wish for greater detail in some of the more technical entries at the expense of a number of words commonly found in any ordinary English language dictionary.

This edition has been amended and extended for British readers by Dr. William P. Abbott, but still retains some Americanisms, both technical and etymological. As well as the straight dictionary arrangement there is a handy conversion table and a list of the chemical elements.

I.H.W.

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Who Owns Whom

Compiled and published by O. W. Roskill and Co. (Reports) Ltd. London. 1961. Pp. 561. £6 6s. net.

IN 1960 the value of takeovers and mergers in British commerce and industry totalled £618 million and in the first quarter of 1961 it came to £427 million. Clearly frequent permutations of ownership are continuing and a directory such as this is highly necessary if it is your business to keep up to date with the reshuffling. Section 1, the largest in this book, lists 19,000 subsidiaries with the names of their parent companies, a net increase of 3,000 on the last edition, which compares with an increase of 1,000 in 1960 and demonstrates the continuing high rate of activity in the creation of companies and changes of control. Section 2 lists parent and associate companies and shows their subsidiaries and associates.

New sections list U.K. subsidiaries in Western Europe (the 1960 edition covered only the Common Market), U.K. subsidiaries in the United States, and U.S. subsidiaries in Western Europe.

Aerosols: Science and Technology

Edited by H. R. Shepherd. Interscience Publishers. New York and London. 1961. Pp. 548. \$22.50.

THE aerosol industry is only a very few years old, yet it has already a great success story to tell about its scientific, technological, and commercial accomplishments. Nineteen experts have contributed to this book which describes in 16 chapters not only the theory of aerosols, their containers, valves, propellants, and other parts and ingredients, but also gives much space to the practical applications of aerosols. We learn how aerosols are used in the manufacture of perfumes, cosmetics, hygiene products, pharmaceuticals, foodstuffs, pesticides, coating compounds, and in a multitude of household and industrial specialities, such as space deodorants, window cleaners, spot removers, fire extinguishers, charcoal igniters and shoe polishes. A most valuable, up-to-date book, well printed, and illustrated with many fine pictures, tables, and working formulae.

R. SEIDEN.

Surface Activity

By J. L. Moillet, B. Collie and W. Black. 2nd Edn., revised and enlarged. E. and F. N. Spon, London, 1961. Pp. 518. 75s. net.

A 30% INCREASE in size in a second edition issued ten years after the first is a sign of the rapid development in the field of surface activity. No one is better qualified to deal with these advances than the authors of the present work. It is the best book on surface activity in the English language.

The book merits such praise because it deals with the three linked aspects of surface activity—the physical chemistry, the technical applications, and the chemical constitution of surface-active agents. All three sections have been enlarged because of the developments of the last ten years. The saddest change is that McBain, the man whose work started chemists looking at surface activity in a different way, changes from the McBain of the first edition, to the late Professor McBain of the second.

Continuing progress in the physical chemistry of surface-active solutions has caused the first section to be considerably enlarged, and our knowledge of the properties of these solutions is now much greater as a result of the new techniques such as radioactive tracers, which are available for study.

New applications of surface-active agents have also appeared in the last ten years, and also a variety of new products. The emphasis on dodecyl benzene sulphonates as the major components of household detergents has altered completely in this period, and one speculates what will be the fashionable product in the third edition.

No chemist working on surface activity can afford to be without this book. It remains the ideal follow-up volume to N. K. Adam's "Physics and Chemistry of Surfaces," and one can pay it no higher compliment.

KENNETH TOMLINSON.

Perfume and Flavour Materials of Natural Origin

By Steffen Arctander. *Det Hoffensbergske Etablissement A/S, Copenhagen, and S. Arctander, P.O. Box 114, Elizabeth, New Jersey.* 1961. Pp. 370. 82s. net.

THIS book gives the practising perfumer and flavour chemist a concise encyclopædic account of most of the

raw materials he is likely to encounter. It complements Guenther's monumental tome on essential oils.

The book is divided into two. The first part deals briefly with definitions and methods of processing the raw materials. Some 20-30 common "forms" of natural materials are discussed, together with expressions used for describing flavour and odour. The term "minimum perceptible" is used throughout the book to express the lowest concentration of a flavour material (in mg. %) at which its characteristic notes can be identified distinctly. The main part comprises monographs of over 600 extracted and processed natural materials giving practical details of their commercial production, evaluation, availability and application. Both sections are arranged in strict alphabetical order and separately supplied with a good cross-referenced index.

For the perfumer the most useful information supplied is that covering resinoids, flower absolutes, animal products and essential oils. In addition to the more detailed descriptions of different qualities and grades of labdanum, oakmoss and ylang, specialised products such as costus, myrrh, reseda, zdravetz and orange flower absolute are equally well presented according to their importance. No undue space is given to linaloe, gingergrass and similar out-dated oils.

On the flavour side, monographs, ranging from coconut absolute and fenugreek extract to a 5-page account of various vanilla preparations, provide current information which hitherto has not been available in one volume. Unfortunately the author does not go far enough. He deals with many items used only in perfumery but omits fruit juices, concentrates, etc., on the grounds that these apply to flavour work exclusively. This is a pity, since

modern information on these topics is very scattered.

In general the shortcomings are few, perhaps the most remiss being the bibliography. Some literature references, to which the reader could refer for further details, could have been included with advantage, despite claims that "the greater part of all information has been re-checked during 1959-60." Nevertheless, this practical handbook is of real value to the perfumery and flavour trades.

B. H. KINGSTON.

Common Chemical Market

Foster D. Snell, New York. 1961. Pp. 243.

THIS is a directory of the chemical industries of the Six and the Seven, the European Common Market and the European Free Trade Association. There is a section for each country, firstly a highly selective preface and then a list of the names and addresses of chemical and allied manufacturers. Each name has a code number denoting one of 21 standard industrial classifications used. The manufacturers in each classification are grouped in countries and towns in the second part of the directory. Thus, it is possible to find quite quickly a drug manufacturer in Wiesbaden, Germany, or a coal briquette producer in Ijmuiden, Holland.

The idea is splendid but the execution seems faulty, judging by the British section. About 800 names and addresses are given, but this cannot possibly be a comprehensive list of all the firms in the 21 groups of industries covered. And it seems odd to find a firm like Morny (perfumes) in the same list as Geo. Wimpey (builders and, incidentally, paving mixture makers). Some of the addresses are wrong. The HQ of I.C.I. never was 149 Park Lane, W.1, and Albright and Wilson's old address has been mixed up with its new one. We have enough good directories for the compilers to consult to make these mistakes inexcusable.

In part two Britain's pharmaceutical industry seems to be the smallest in Europe. Only 36 firms are listed against 19 columns of German firms.

A directory of Europe's chemical industry is certainly needed and the Americans deserve praise for having a go. But the job is one for the Europeans. The directory is yet to appear.

MSS. REQUIRED

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Increasing U.S. Control of Drug Industry

Mr. A. F. HOLT (Liberal, Bolton, W.) spoke of "the increasing control of the British drug industry by United States firms" and asked what action it was intended to take to limit the amount of drugs bought from them.

The Minister of Health indicated "none" and Mr. Holt then declared: "Some of the American firms have been responsible for the high pressure type of salesmanship which seems to have led to a waste in drugs. Have any representations been made to them to cease some of these practices so that we can get greater economy in the drug bill?"

Mr. Powell told him: "I am anxious by any means to ensure that the National Health Service gets the drugs it needs on the best possible terms, but I do not think that would be done by discriminating against one set of firms as such. The Association of British Pharmaceutical Industry has taken some quite successful steps in recent years to increase the standards of sales promotion in some quarters."

Drugs and drink

What steps were taken to warn persons for whom barbiturate drugs were prescribed that it was dangerous to consume alcohol within a short time of taking the drugs? inquired Lieut. Col. J. K. Cordeaux (Conservative, Nottingham, C.).

Miss Edith Pitt, Parliamentary Secretary to the Ministry of Health, said it was a matter for the doctor, who was reminded in both the British National Formulary and the Comprehensive Handbook on Prescribing of the need to warn the patient.

The M.P. said the number of deaths caused by a combination of alcohol and barbiturate drugs was twice as great in 1960 as in 1959. He suggested issuing regulations to dispensers requiring them to use a label for the containers of these drugs warning of the danger. Miss Pitt replied that the right person to issue the warning was the doctor who prescribed the barbiturates.

Chemists on strike?

The possibility of a strike by dispensing chemists over the increased

prescription charges was referred to by Mr. Laurence Pavitt (Labour, Willesden, W.). He said there was great dissatisfaction among them at the change in dispensing habits of the public who came at the end of the week—pay day—rather than at the beginning. Asking if there was a threat of a strike on this account, Mr. Pavitt added: "If so, what emergency plans has the Minister to meet the desire of patients to have their medicines?" Mr. Powell said he had had no representations on a change in dispensing habits.

Another question related to the increased prescription charge came in the form of a request for a make-up pack for diabetic patients who had regular prescriptions issued under one heading, so as to ease the burden falling upon patients who were charged for every item.

Miss Pitt said that a urine sugar analysis set, containing a test tube, dropper, 36 diagnostic tablets, a colour chart, instruction sheet and analysis record, was prescribable as one item. A more comprehensive pack for diabetic patients had not been found practicable; but two types of insulin prescribed at the same time counted as one item.

"Kotol" seed dressing

In view of the recent warning about the use of dieldrin, aldrin and heptachlor, said Mr. H. Clark (Ulster Unionist, Antrim, N.), the Minister of Agriculture should issue a statement on the use, as an alternative seed-dressing, of Kotol, which was based on gamma BHC.

Mr. Christopher Soames replied that seed dressings containing gamma

BHC had been extensively used since the war to control wireworm and other insect pests, but he understood the manufacturers of Kotol did not recommend its use against wheat bulb fly. There was no evidence to suggest that gamma BHC had caused any appreciable casualties to wild life and its use in seed dressings was not therefore restricted under the recent arrangements affecting dieldrin, aldrin and heptachlor.

Toxic detergent foam?

The problem of foam from synthetic detergents was raised in questions to the Minister of Housing and Local Government.

Mr. J. M. L. Prior (Conservative, Lowestoft) asked what investigations had taken place to discover the degree of toxicity in detergent foam blown on to grasslands or crops grazed by cattle. Mr. Henry Brooke replied he was not aware of anything toxic in the foam or anything which would harm grazing cattle. This did not mean that the foam from this source was not a nuisance, and his Standing Technical Committee* was doing all it could to see how detergents could be improved from this point of view.

The M.P. then asked whether the Minister was aware that manufacturers included in these detergents a foam stabilising substance which caused a nuisance in domestic plumbing, sewage works, rivers and canals receiving treated sewage, and users of such waterways. In view of the damage caused, urged Mr. Prior, the Minister should consult the manufacturers with a view to banning its use.

Mr. Brooke explained that the Standing Committee on Synthetic Detergents expressed the view in its second progress report that it was unlikely that any significant quantities of foam stabilisers would normally be present in treated effluents or river water. There had been few cases of nuisance in domestic plumbing, and these had been remedied with little difficulty. In these circumstances, he saw no cause for taking the special action suggested.

* See Editorial note in this issue.

* THE OCTOBER ISSUE *
* Here are some of the articles *
* you can read in next month's *
* "Manufacturing Chemist" *
* PIPING UP OF CHEMICAL PLANTS *
* TABLET FORMULATION *
* HOW BIG SHOULD A STORAGE *
* TANK BE? *
* SULPHONATION OF DETERGENT *
* MATERIALS WITH CONVERTER GAS *
* IRON TREATMENT OF PIG *
* ANAEMIA *

Medical reps may be barred from hospitals

Unnecessarily costly prescribing is partly caused by "indiscriminate visits to junior doctors in hospital by representatives of pharmaceutical firms" says the Minister of Health in a new letter to hospitals urging them to cut expenditure on drugs and dressings. Mr. Powell asks hospitals to discuss with medical staffs the extent to which medical reps should be allowed to enter hospital premises.

The new Ministry onslaught on drug costs recommends joint purchasing and the prescribing of standard drugs to cut expenditure, which continues to rise.

Unilever to buy Domestos

Unilever, has made an offer of £2.5 million for Pinoya Holdings Ltd., owners of the *Domestos* and *Sgezy* brands of washing products.

The formal offer will be equivalent to a price of 27s. per share for the 1,860,408 5s. ordinary shares of Pinoya. The formal offer should be in the hands of shareholders before the end of September. Pinoya's directors recommend acceptance.

Max Factor acquires Corday

Max Factor and Co. has acquired all the outstanding capital stock of Parfumerie Internationale Corday, Paris; Parfums Corday Inc., New York, and subsidiary corporations. Corday will become a wholly owned subsidiary of Max Factor and Co. with present management retained.

New plastics films merger

I.C.I. Ltd. and E. S. and A. Robinson (Holdings) Ltd. of Bristol are entering into an association to develop the uses of plastic films in the packaging industry.

I.C.I. are subscribing for a minority interest in a new Robinson subsidiary to be called Robinson Plastic Films Ltd., which will manufacture a wide range of plastic film products for the packaging industry. Robinsons are acquiring a minority interest in British Visqueen Ltd., an I.C.I. subsidiary making polythene and other plastic films.

Polypropylene film factory

Metal Box Co. Ltd. and Shorko (a joint venture between Shell and National Distillers and Chemical Corporation of New York) are to form a joint company to erect and operate a factory in Britain to make polypropylene film and film products.



EMERGENCY!

This lorry carrying ten tons of medical supplies overturned shortly after starting out from the Hounslow factory of Parke Davis en route to the new PD depot at Crewe. Urgent orders were duplicated and sent by other routes.

Kestner's new foundry

The president of the Kestner Evaporator and Engineering Co. Ltd. recently unveiled a plaque to commemorate the inauguration of their new foundry at Greenhithe. This foundry is the first part of the complete move of their works from New Cross to Greenhithe. A new drawing office is being built to house 60 draughtsmen. On completion the factory floor area will be some 100,000 sq. ft. The move will be completed in about six months.

The new foundry is making castings of *Tantiron* (the company's acid resisting silicon iron) and lead alloy resisting castings. Five furnaces have been installed giving an output of 10 tons of *Tantiron* castings per week. There is room to increase this plant to double the output.

U.K. Input-output 1954

A new booklet containing a set of input-output tables for the U.K. in respect of the year 1954 has been published by H.M. Stationery Office, price 7s. 6d. The publication was prepared jointly by the Board of Trade and the Central Statistical Office, and is based largely on an analysis of the data contained in the detailed Census of Production for 1954 and the National Income Blue Book for 1960.

The input-output tables provide details of the purchases and sales of 46 different industry groups, of which 38 are in manufacturing industry. Convenient summaries of the detailed figures are also given for 12 major industry groups. For each industry group, figures are given of its purchases from each of the other industry groups and from abroad, of its sales to each of the other industry groups, of its sales for final consumption by personal consumers and public authorities, and its sales for investment and exports.

The tables show that the chemicals and dyes industry group exported 24% of its output directly and a further 16% indirectly.

Laboratory furniture

Griffin and George Ltd. and Grundy Equipment Ltd. have been associated for several years in the manufacture and marketing of metal laboratory furniture and laboratory apparatus.

A closer link has now been forged whereby the Grundy Group becomes responsible also for the manufacture of wood laboratory furniture at their Cowley, Middx., and Mitcham joinery works. Marketing will continue to be handled solely by Griffin and George (Laboratory Construction) Ltd.

Bristol chemistry building

A contract to build a chemistry teaching block for Bristol University costing £630,000 has been awarded to Holland and Hannen and Cubitts (Great Britain) Ltd. The contract is part of a scheme to build a new School of Chemistry at a total cost of about £1½ million.

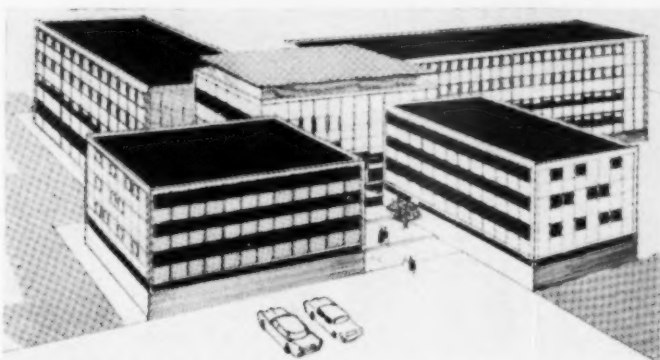
Work on the teaching block will start in September and other new buildings, including research blocks, lecture theatres and library, will be added by 1965. The teaching block, will measure 125 ft. by 105 ft., with an overall height of 84 ft., and a cantilever lecture theatre will form a prominent feature.

I.C.I. Profit-sharing scheme

Over 92,000 I.C.I. employees will share a bonus of £8,555,000 gross, which after deduction of personal income tax is £6,344,000 (average per employee £68 17s. 7d.). This net bonus will be used to buy on behalf of employees £1,883,000 I.C.I. ordinary stock to be issued by the company out of its unissued capital.

Company finance

The directors of Borax (Holdings) Ltd., have declared an Interim Dividend in respect of the year to September 30, 1961, of 4% on the Deferred Ordinary Stock subject to tax.



A new research and development centre is under construction by the Reed Paper Group at its Aylesford (Kent) site. The first stage (drawing) comprises a £500,000 laboratory, providing about 50,000 sq. ft. of laboratory floor area, a pilot plant building of about 12,000 sq. ft., and office space amounting to 10,000 sq. ft. It is due to open in May 1962.

Approved names for drugs

The July supplementary list of approved names issued by the British Pharmacopoeia Commission is as follows. All enquiries should be sent to the Commission at 44 Hallam Street, London, W.1.

Approved Name	Other Names
BAMIPINE	
4-(<i>N</i> -Benzylanilino)-1-methylpiperidine	
Soventol	
BUCETIN	
<i>N</i> -β-Hydroxybutyryl- <i>p</i> -phenetidine	
CHLORPHENTERMINE	
4-Chloro- <i>α,α</i> -dimethylphenethylamine	
Lucofen is the hydrochloride	
DITRIADIONE	
5 : 5-Diethyloxazolidine-2 : 4-dione	
HALETHAZOLE	
5 - Chloro - 2 - (<i>p</i> - 2 - diethylaminoethoxyphenyl) - benzothiazole	
Episol	
HALQUINOL	
A mixture of the chlorinated products of 8-hydroxyquinoline containing about 65 per cent of 5 : 7-dichloro-8-hydroxyquinoline	
Quixalin	
LAUROLINIUM ACETATE	
4-Amino-1-dodecylaluminium acetate	
Laurodin	
LYNOESTRENOL	
17 α -Ethynyl-17 β -estr-4-en-17 β -ol	
Orgometril	
PARAMETHASONE	
6 α - Fluoro - 11 β : 17 α : 21 - trihydroxy-16 α - methylpregna-1 : 4-diene-3 : 20-dione	
6 α -Fluoro-16 α -methylprednisolone	
Haldrone is the 21-acetate	
THENYLDIAMINE	
<i>N</i> ' <i>N</i> ' - Dimethyl - <i>N</i> ' - 2 - pyridyl - <i>N</i> ' - 3 - thenyl-ethylenediamine	
TIGLODINE	
Tiglylsulfoalotropine	

INDEX TO THE SUPPLEMENTARY LIST

Proprietary Name	Approved Name
Episol	Halethazole
Haldrone	Paramethasone
Laurodin	Laurolinium Acetate
Lucofen	Chlorphentermine
Orgometril	Lyncestrenol
Quixalin	Halquinol
Soventol	Bamipin

Farm chemicals directory

The 1961 directory of the Association of British Manufacturers of Agricultural Chemicals has been completely revised. It lists members and their products and an entirely new section lists the many common names which have been given to the complex chemicals used for crop protection. Proprietary and trade names are also given.

Unilever take-over

The boards of Unilever Ltd. and E. R. Holloway Ltd. have agreed that Unilever will purchase the whole of the issued capital of Holloway.

Holloway is a private company producing and marketing injection moulded and welded articles, polythene bottles and containers, and various toilet preparations which are manufactured or sold by five wholly owned subsidiaries of Holloway.

THE TECHNICAL PRESS IN SEPTEMBER

Water Purification and Desalination

Chemical and Process Engineering publishes a special feature comprising three articles: "Desalination of Water," "Design of Flash Evaporators," and "Aquaflash Desalination of Plant." Filtration is the subject of a unit operations review. Another article in the series on constructional materials for chemical plant features ceramics.

Food Manufacture contains a special supplement on packaging, with a review of materials, methods and new packs. Articles include "Developments in Labelling" and "Colour in Packaging." The factory visit, illustrated in colour, describes Brown and Polson's new dextrose plant.

Dairy Engineering also features packaging, with a review of advances in the packaging of dairy products and an article on Swiss packaging methods. "Ten years of Gas Liquor" is the subject of another article.

In **Petroleum** this month there is an investigation of the oil rivalry in India and a description of Standard Oil's Toledo refinery—"the world's most modern." There is an article on water gas conversion.

Corrosion Technology contains a packaging review and an informative article on corrosion research trends in the U.S.S.R. "Anti-corrosive Elastomeric Linings for Industrial Use" is the title of another article.

Fibres and Plastics reviews reinforced plastics in transport, in particular aircraft. Other articles include: "Petrochemicals and Plastics in Japan," "Belgium's Plastics Industry," and an examination of Rilsan and its properties.

Agricultural aviation is the main feature in **World Crops**, which deals with the choice of an agricultural aircraft, aerial photography and agriculture and aerial farming in Australia.

Building Materials discusses thermal insulation and developments in systems of construction and application of materials.

In **Public Works and Muck Shifter**, "The Application of Hydraulics to Earthmoving Equipment," "The Replacement of Rollers by Balls in Excavator Slewing Rings," and "Revolving Tower Cranes for Construction Sites," are three articles.

Paint Manufacture surveys filling and lidding machines for paint and fibreboard containers for paint cans.

For specimen copies apply to the Circulation Manager, Leonard Hill House, Eden Street, London, N.W.1

B.P.C. Amendments

The Pharmaceutical Society has authorised the publication of the following amendments to the British Pharmaceutical Codex 1959.

Part VI

Page	
979	Eye Lotions
1019	Lotion of Lead
	Lotion of Lead, Evaporating
1027	Mixture of Acetylsalicylic Acid
	Mixture of Acetylsalicylic Acid for Infants
	The directive that these preparations "should be freshly prepared" is amended to "must be freshly prepared."
949	Draught of Male Fern Extract
	Draught of Paraldehyde
1034	Mixture of Ferrous Sulphate
	Mixture of Ferrous Sulphate for Infants
1037	Mixture of Gentian with Phenobarbitone, Alkaline
1051	Mixture of Sodium Chloride, Compound
	The directive that these preparations "should be freshly prepared" is amended to "should be recently prepared."

Reprints of these amendments can be obtained on application, enclosing a stamped addressed envelope, to the Pharmaceutical Press, 17 Bloomsbury Square, London, W.C.1.

The Earl of Courtown, head of the office administration department of I.C.I. Ltd., has been re-elected president of the Institute of Office Management. **Denis Greensmith**, controller, administrative services, Boots Pure Drug Co. Ltd., was elected chairman of the Institute council.

Dr. F. C. Lloyd has joined F. W. Berk and Co. Ltd. as development director, although not a member of the main board. Dr. Lloyd was formerly Research Manager of B.X. Plastics Ltd.

Dr. F. A. Robinson, who is the new chairman of The Crookes Laboratories, relieves **N. B. Smiley** of Arthur Guinness Son and Co., which acquired Crookes jointly with Philips Electrical Industries last November. (See M.C. August.)

G. H. W. Cullinan, deputy managing director, Shell Chemical Co. Ltd., has given up his executive duties but remains a director and will continue to represent the company on the council of the A.B.C.M. and at the F.B.I. Mr. Cullinan joined Shell from Oxford in 1926.

B. H. Oldfield, director and engineering manager of Laporte Chemicals Ltd., is to retire in September. He will be succeeded as engineering manager by **Maurice Ruddick**.

Lord Shawcross, Q.C., has been appointed chairman of the Medical Research Council. He succeeds **Viscount Amory**, who has been appointed U.K. High Commissioner in Canada.

C. T. Ward, managing director of Plant Protection Ltd., retired on July 31 after 33 years' service with Imperial Chemical Industries Ltd. Responsibility for home sales now lies with **W. Johnstone**, whose appointment as commercial director of Plant Protection Ltd. was announced earlier this year.

Dr. E. Holmes, technical services director of Plant Protection Ltd., retired on July 31 after 33 years' service with Imperial Chemical Industries Ltd. Responsibility for technical services work will now lie with **Dr. W. R. Boon**, research and development director of Plant Protection Ltd.

E. S. Lower, managing director (research) and **N. R. Kirkby**, sales director, of Croda Ltd., flew to New York on September 2 for a three-week stay in the United States, most of which time will be spent with the sister company, Croda Inc. They will visit diverse users of Croda products varying from the steel industry to cosmetics.



F. C. Lloyd



F. A. Robinson

Dr. C. J. Jackson, of the Distillers Co. Ltd. has been appointed a member of the Central Advisory Water Committee for England and Wales. The appointment has been made by the Minister of Housing and Local Government. Dr. Jackson advises Distillers on water supply and effluent disposal.

Norman J. Travis and **James D. Tennant**, directors of Borax (Holdings) Ltd., have been appointed to the board of Hardman and Holden Ltd.

David K. Watkins, M.P.S., has been promoted sales manager of William R. Warner, pharmaceutical division. Mr. Watkins graduated at Brighton School of Pharmacy. He joined Warner in 1957. **Francis R. Elkins**, M.P.S., has been appointed marketing and sales promotion group manager of William R. Warner and Co. Ltd. He joined the company in 1956 from Bengers.

As from January 1, 1962, **W. F. Mitchell** will be appointed executive vice-president of Shell Oil Co. of Canada Ltd., Toronto. He will be succeeded as chemical director of co-ordination with Shell International Chemical Co. Ltd. in London by **Willem Starrenburg**, aged 51. Mr. Starrenburg is regional oil co-ordinator for the Caribbean, Central and South America. He is a director of Shell International Petroleum Co. Ltd.

Dr. E. G. Woodroffe has been appointed a director of Unilever Ltd. as a vice-chairman of the board in succession to the late **Mr. J. A. Connel**. He joined the company in 1935.

Bacteriologists' officers

At the annual meeting of the society for Applied Bacteriology the following were elected: *Hon. President*, Mr. G. Sykes; *Hon. Secretary*, Dr. Ella M. Barnes; *Hon. Treasurer*, Mr. G. Elis Jones.

Obituaries

L. H. Tearle, chairman and managing director, Lawrence H. Tearle and Co. Ltd., has died at the age of 45. Mr. Tearle was at one time an executive at Leonard Hill Limited, and personal assistant to Mr. Leonard Hill. About twelve years ago he started a group of technical journals in South Africa and later opened a London office, from which he published *Grocery World* and *Handling International*.

We extend our sympathy to his widow and five children. His widow (formerly Miss Joan Redhouse), was also for many years a valued employee of the Leonard Hill Group.

W. J. V. Ward, chairman of the Billingham Division, I.C.I., died on Thursday August 10, in Stockton and Thornaby Hospital. He had been seriously ill for a week. Mr. Ward had been chairman of the Billingham Division since February, 1955, and the whole of his 35 years' service with I.C.I. had been with that Division. He was nearly 59. He came to Billingham in 1926 as a chemist in the research department laboratories.

Mr. Ward leaves a widow and three daughters, two of whom were married about a year ago.

C. W. Beck, a director of Laporte Acids Ltd. and manager of the Hunt Works, Castleford, has died at 64. He was due to retire next year.

He joined Hunt Brothers (Castleford) Ltd. in 1924 and became a director of the company and also of John Nicholson and Sons Ltd. of Hunslet. He remained a director when these companies amalgamated under the name Laporte Acids Ltd.

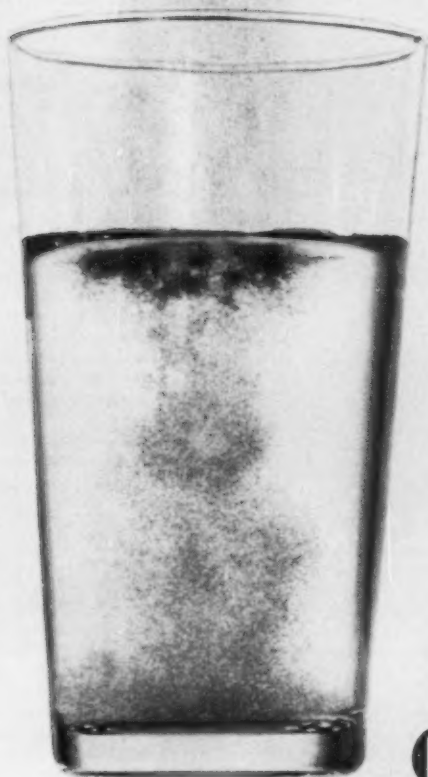
Television interview

Miss Mary Goldring, a former Editor of the Leonard Hill Technical Group, was interviewed in a B.B.C. T.V. programme on the political and technical implications of the space flight of Major Titov in the Russian Vostok II space ship.

New addresses

C. Skerman and Sons Ltd., copper-smiths, engineers and machinery merchants, have moved to 10 Parsons Green, London, S.W.6. Telephone RENown 6402/6.

John Goshon and Co. Ltd. of Vauxhall, London, S.E.1, makers of packaging and industrial tapes, have moved to Kensington Church Street, London, W.8.



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minute
flat!**

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Remarkable new Krastay gels; stabilizes; suspends; thickens; emulsifies. The secret is the strikingly efficient and edible emulsifying agent, carrageen moss. Special techniques have been developed in America for harvesting this rare and valuable product in bulk. Krastay's uses in manufacturing industries are almost limitless. It is compatible with most compounds; goes completely into solution at 165°F°; and its special properties help you produce a smoother more consistent product, with great economy. And Krastay has many extra advantages over and above its unique emulsifying properties. For instance, when used in creams it automatically forms a microscopic film to prevent the unused cream from drying out, and also greatly improves 'handslip'. *Krastay is available in 10-lb, 20-lb and 200-lb drums—at competitive prices.*



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Please supply ___ of ___ lb. Krastay drums to:

NAME _____

ADDRESS _____

Or write for details.

MC1

News from Abroad

ARGENTINE

U.S. help for phenol plant

Hooker Chemical Corporation is to buy a half interest in Duranor, Industrias Químicas Sociedad Anonima Industrial y Comercial.

The U.S. will lend Duranor \$2 million to buy American chemical plant for its new factory at Rio Tercero, Cordoba, which will produce 25 metric tons of phenol per day. Also produced will be approximately 100 metric tons per month of monochlorobenzene for sale over and above Duranor's needs. Facilities will also be installed for processing by-product dichlorobenzenes, for sale.

HOLLAND

New stearates plant

The Koninklijke Stearine Kaarsen-fabrieken "Gouda-Apollo" of Gouda, has formed a subsidiary company named Witco-Gouda Stearaten N.V. The new company will produce metallic stearates under the licence of the Witco Chemical Co. Inc., New York. Gouda-Apollo will supply the new company with the fatty acids required as raw materials.

The stearates plant, now under construction on the site of Gouda-Apollo at Gouda, will go on stream in a few months.

The products will be used principally in the rubber, plastics and paint industries.

ISRAEL

Tumour diagnosis

A new way of discovering and locating brain growths, with the aid of the isotope fluorine-18, has been evolved by two Israeli scientists, Prof. Inbar of the Weizmann Institute's Isotope Department, Rehovot, and Dr. Laor of Israel's Atomic Energy Committee. It is an improvement on procedures which utilise radioactive arsenic and copper, since the patient receives less than 1% of the radiation emanating from these materials. Other advantages of fluorine-18 are that it is short-lived, which makes it possible to repeat the examination within a few hours, and it can also be administered orally. Arsenic and copper have to be injected.

The isotope was manufactured at the Israel experimental atomic installation of Nahal-Sorek.

De-salting by electrodialysis

A household saline water demineraliser has been developed by Israeli scientists. It is the size of a small kitchen stove and has a daily maximum capacity of 1,000 litres. It can reduce a salt content of 3,000 mg. per litre to one of 500 mg. which is within the range of drinking water. It works by electrodialysis, using specially prepared membranes. New

membranes have been developed at the Negev Institute for Arid Zone Research, Beersheba, where the new device was constructed. Unlike most other units, the Israeli model does not require acid to prevent scale from forming.

Larger units able to supply between 250,000 and 500,000 gal. of desalinated water per day are under development at the Negev Institute.

AUSTRALIA

Dr. Bazeley demoted

Dr. P. L. Bazeley, director of the Commonwealth Serum Laboratories, Melbourne, has been removed from office and reduced to a senior medical officer, grade 3, with a salary drop from £5,308 to £4,433 a year.

Grade 3 is the top professional grading in the Public Service.

The penalty comes after Dr. Bazeley's suspension in May last and a Public Service Board enquiry into charges of improper conduct. Charges were that, as an officer of the Public Service, he made statements to the press in criticism of, and of having attempted to promote opposition to, the Commonwealth Serum Laboratories Bill introduced into Parliament by the Government.

The Federal Government expects to be able to appoint men "of outstanding ability" to form the commission which will in future operate the Commonwealth Serum Laboratories. The commission will produce and sell a wide range of biological products, and will be authorised to undertake research towards improving the production of all its products.

U.S.A.

New plants will be computer controlled

The American associates of Honeywell Controls Ltd. have supplied four digital computers and a full complement of electronic instruments to Monsanto Chemical Co. for their hydrocarbon raw materials plant now under construction in Texas. The new plant at Chocolate Bayou, which will operate in late 1962, will include the world's largest ethylene unit with annual capacity exceeding 500m. lb. The plant will also produce benzene, naphthalene, propylene, cumene, phenol, acetone, ethyl benzene and other hydrocarbons.

A computer-directed control system has also been ordered by Celanese Corp. of America for its new acetyl manufacturing plant at Bay City, Texas. The integrated system will perform on-line monitoring and control of a new process for producing acetaldehyde used for paints, plastics, synthetic rubber, fibres, dyes, drugs, etc. The new acetaldehyde process uses ethylene gas and oxygen as

raw materials, and it has been licensed by Aldehyd G.m.b.H., jointly owned by Farbwerke Hoechst and Wacker-Chemie.

The Bay City Plant is scheduled for operation in 1962 and will enable Celanese to produce more than 500,000,000 lb. of acetyl chemicals annually.

Price fixing "conspiracy"

A grand jury in New York charged three of America's largest pharmaceutical manufacturers (and their top officers) with conspiring to maintain excessively high prices and to monopolise the manufacture and distribution of tetracycline drugs.

The companies are Charles Pfizer and Co., the American Cyanamid Co. and Bristol-Myers (two more firms have been mentioned as co-conspirators).

Retail sales of these widely-used antibiotics are running at about £250 million a year and the Justice Department claims that the accused are responsible for nearly three-quarters of this business.

Maximum penalties could be prison sentences for the company presidents and heavy fines for both them and their companies.

ITALY

Steroid drugs link-up

Recordati S.p.A., Milan, have signed an agreement with the Syntex Group, producers of steroid hormones, for the sole rights of production and distribution in Italy of Syntex hormone specialities.

Three thousand new steroids have been synthesised and systematically screened in the Syntex Laboratories, Mexico City, with the co-operation of research workers and scientists in universities and institutions all over the world. Now tons of hormonal substances are produced from vegetable sources. In ten years, Syntex have prepared 150,000 kg. of these substances, sufficient for 15 billion ampoules.

Syntex's steroids have been marketed in many foreign countries as the result of agreements between Syntex and other international firms. Recordati and Syntex, both of whom produce their own raw materials and undertake pure research work, believe that the linking of their trademarks will constitute a guarantee of scientifically sound steroid drugs and a symbol of steady advance in steroid hormone therapy.

THE CHEMICAL MARKET

Phenol is down by 1d. per lb., otherwise there are no important price changes this month. Our last full list of prices appeared July, pp. 337-8.

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...BEAUTY FADED HAS NO SECOND SPRING

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Competitive quotations on request

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New Products

Gelatine fingernails treatment

Pronel is a new British product for the treatment of unattractive fingernails.

Its basic constituent is gelatine, "which research has shown to be the most effective cure for bad fingernails."

Pronel is taken orally. Daily dose is three spoonfuls mixed in cold or warm water. The formula contains a lemon flavouring. The makers say that owing to the fact that it takes three months for a new nail to grow from cuticle to tip, *Pronel* has to be taken daily over a period to ensure curative results. It is supplied in a pack containing one month's supply.

The formula is as follows:

Pure gelatine concentrated			
Protein 85-87			
Flavouring			
Colouring			
Saccharine			
Tartaric acid			
Vitamins			
B ₁	..	..	0.5 mg.
B ₂	..	..	0.5 mg.
C	..	..	15.0 mg.
Nicotinamide	..	..	7.5 mg.
Minerals			
Ferrous sulphate to give			
	10 mg.	iron	
Dicalcium phosphate to give			
	27.9 mg.	calcium	
	21.6 mg.	phosphorus	
Manganese sulphate			
	0.5 mg.	manganese	
Sodium molybdate to give			
	0.1 mg.	molybdenum	
Potassium iodide to give			
	0.15 mg.	iodine	

It is claimed that between 60 and 65% of a sample of women with nail problems reported that it fully restored their nails after three months' course; 25% noted marked improvement.

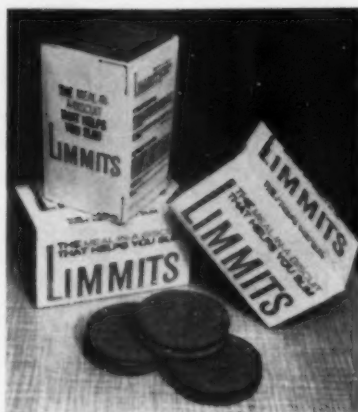
Pronel is made by P. Leiner and Sons Ltd., the world's largest ossein gelatine producers.

Anti-anemia drug for piglets

Benger Laboratories have introduced *Imposil 200* brand of "ferrimicrodex," claimed to be a more potent intramuscular iron supplement for the prevention of anaemia in piglets and other animals. Each 2 c.c. dose contains 200 mg. of elemental iron and should be injected into the ham muscle of the piglet at three days of age.

This product is a development of *Imposil*, containing 150 mg. of iron in every 2 c.c., which has been accepted as an effective prophylactic against iron deficiency.

Imposil 200 is fully absorbed and totally utilised and field trials show that the additional iron per dose provides greater protection to the piglet against iron deficiency and associated secondary infections.



Limits biscuits made by Leas Cliff Products Ltd., Folkestone, a subsidiary of Pfizer, are both a dietary preparation and a satisfying food. Each Limmits provides 175 calories and contains 3.07 g. protein, 15.5 g. carbohydrate and 11 g. fat and a packet of six costs 3s. 11d. It contains no appetite depressant drugs, and clinical trials have recorded an average weight loss of 6½ lb. in ten days.

The product is available in three vial sizes. Prices are: 20 c.c. (10 doses) 16s. 8d. (trade); 50 c.c. (25 doses) 40s.; 100 c.c. (50 doses) 70s.

Injection without hypodermic syringe

Recently the Ministry of Health informed the Joint Pricing Committee for England and Wales that payment may now be allowed for drugs in disposable injection units. These units include *Distampin* Injectors which have been available for a number of years to hospitals only from the Distillers Co. (Biochemicals) Ltd. In consequence of the new ruling, new packs of these injectors for stocking by retail pharmacists to meet prescriptions from general practitioners have now been made available.

The *Distampin* Injector is a complete sterile unit ready for immediate use. The unit is hermetically sealed and consists of an ampoule holding, under gas pressure (sterile air), one dose of the solution for injection attached to a sterile hypodermic needle. The connection between the ampoule and the needle is a transparent polythene tube. When the cover has been removed and the needle inserted into the tissues, the injector is activated by breaking the shank of the ampoule (as in breaking a matchstick), the gas pressure inside the ampoule automatically ejecting the solution into

the tissue. The entire injector is then discarded.

The unit also contains a filter on the hub of the needle. This prevents any glass particles escaping from the broken shank of the ampoule. In addition, aspiration can be conducted by squeezing and releasing the flexible polythene tube. If during this operation blood appears on the filter pad, the needle is in a vein and should be withdrawn.

The obvious advantages of the injectors are that there is no solution to prepare, nothing to sterilise, nothing to assemble, no syringe to fill and there is a new needle for each injection. A most important aspect of the use of fresh needles is the elimination of the risk of syringe-transmitted hepatitis. Furthermore, at no time does the operator come in contact with the drug to be injected, so that the risk of contact allergy from such drugs as penicillin and streptomycin is minimised.

The products available in the injector are:

"Distaquaine" Suspension (Injection of procaine penicillin B.P.)	Trade Price
3 ml. (300,000 units per ml.)	Box of 5 Injectors 11s. 3d.
"Streptaquaine" I in 4 (Injection of streptomycin sulphate B.P.)	
4 ml. (0.25 gram per ml.)	Box of 5 Injectors 10s. Exempt Purchase Tax.

Both products are subject to T.S.A. (Part 2) and may be supplied upon prescription only.

Sensitive skin depilatory

Nair Cream for sensitive skin is a new cream hair remover for the face made by Pretested Products, the makers of Nair Lotion for legs. It is claimed to be non-irritant and quick-acting. It is pleasantly fragrant and leaves the skin soft after use, and costs 4s. 3d. a tube.

Injectible dye

I.C.I. Ltd. Pharmaceuticals division have announced that Disulphine Blue Intravenous Injection is now available.

Disulphine Blue is an intravital dye used as a simple and direct visual test of the state of the circulation in normal and damaged tissues. It is of particular value in the accurate diagnosis and the surgical management of burns and soft tissue trauma.

0.25 ml.—0.5 ml./kg. bodyweight, given by slow intravenous injection, is satisfactory for most cases. The product is issued as a 6.2% sterile solution in 10 ml. ampoules, boxes of 10. Retail price each: 180s., trade price each: 120s.

TRANSPARENT BATCH WRAPPING

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DIOphane wrapped—in batches of 4, 6, 12 or more—your product is doubly safe from dirt, dust and moisture.

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Estimated savings in over-all packaging and distribution costs by as much as 25 per cent with the elimination of cartons and heavy overwraps.

These advantages include . . .

- * Lower capital investment in packaging materials.
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- * Mechanical wrapping to replace hand cartoning.
- * Faster working than paper on wrapping machines and fewer reel changes.
- * Easier stock control and order making-up for the wholesaler and retailer.
- * Saving in shipping freight.

For fuller information on this practical and economical method of wrapping consult . . .

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Manufacturing Chemist—September, 1961



NEW PATENTS

COMPLETE SPECIFICATIONS
ACCEPTED

Detergents

Liquid-detergent compositions. *Unilever Ltd.* 870,081.

Fungicides

Chlorinated bicycloheptenes and fungicidal compositions containing them. *Velsicol Chemical Corporation.* 868,910.

Insecticides

Process for the extraction of pyrethrins from pyrethrum flowers. *L. W. Levy,* 870,459.

Miscellaneous

Phenylalkylamine derivatives and a method for their preparation. *Smith, Kline and French Laboratories.* 870,541.

Dyestuffs

Monoazo dyestuffs and the production of same. *Badische Anilin- and Soda-Fabrik A.G.* 868,742.

Dyestuffs of the anthraquinone series and their production. *Badische Anilin- and Soda-Fabrik A.G.* 868,744.

Water-soluble monoazo dyestuffs and their production. *Badische Anilin- and Soda-Fabrik A.G.* 868,745.

Dyestuffs of the azaporphin series and their production. *Badische Anilin- and Soda-Fabrik A.G.* 868,746.

Production of water-soluble dyestuffs of the azaporphin series. *Badische Anilin- and Soda-Fabrik A.G.* 868,747.

Polyazo-dyestuffs derived from 3:3'-dihydroxydiphenylamine and process for their manufacture. *Farbwerke Hoechst A.G.* 869,856.

Azo dyestuffs containing thiocyanalkyl groups. *Farbenfabriken Bayer A.G.* 870,580.

Dyestuffs of the anthraquinone series and their production. *Badische Anilin- and Soda-Fabrik A.G.* 868,743.

Silicon containing zoiic dyestuffs and a process for their preparation. *Union Carbide Corporation.* 870,467.

New patents are from the *Journal of Patents*, and new trade marks are from the *Trade Marks Journal*. In each case permission to publish has been given by the controller of Her Majesty's Stationery Office. Each of the publications mentioned is obtainable from the Patent Office, 26 Southampton Buildings, London, W.C.2.

NEW TRADE MARKS

APPLICATIONS

Cosmetics and toilet preparations

CASTALIA.—8008,588. *Hans Schwarzkopf.*

IVAZIL.—809,069. *Ravensberg G.m.b.H.*

ORTABS.—812,770. *D. and W. Gibbs Ltd.*

FLUROGARD.—812,990; FLUORODENT.—813,038. *County Laboratories Ltd.*

ACCENT.—813,377. *Huntington Laboratories Inc.*

RENOIR.—815,321. *Ulter (Bradford) Ltd.*

LUVIL.—815,591. *Lever Brothers, Port Sunlight, Ltd.*

PANORAMA.—815,671. *Boots Pure Drug Co. Ltd.*

SUPERMA COLOR-BUBBLE.—805,769. *Superma Ltd.*

DYNAMO.—806,254. *Colgate-Palmolive Co.*

COLLOMANDA.—808,592. *Hans Schwarzkopf.*

ELET.—809,352. *County Laboratories Ltd.*

"CLEOPATRA."—811,544. *André Phillippe Ltd.*

BRECK.—813,531. *John H. Breck Inc.*

DASH.—814,651. *Thomas Hedley and Co. Ltd.*

REVAN.—815,303. *Evans Medical Ltd.*

WHO DARES?—817,493. *André Marc Byrne.*

Pharmaceuticals

PASELLA.—801,493. *Citrelux Ltd.*

LOCALYN.—807,671. *Syntex Corporation.*

DAXID.—808,194. *Chas. Pfizer and Co. Inc.*

MUCOLAC.—808,506. *Carlo Erba S.p.A.*

RELAXYL.—810,641. *Franco Indian Pharmaceuticals Private Ltd.*

TIMPAVIT.—812,061. *Istituto Farmacoterapico Italiano S.A.*

NITEX.—812,185. *Winthrop Group Ltd.*

DIMINEX.—813,743. *Warner-Lambert Pharmaceutical Co.*

LEVOSPASME.—813,893. *Les Laboratoires Dausse S.A.*

DIANARIL.—814,092. *Ciba Ltd.*

MAMBOL.—814,603. *Lovens Kemiske Fabriks Handelsaktieselskab.*

VANDID.—814,810. *Riker Laboratories Ltd.*

CHARKAMINTS.—816,559. *Thomas Blake and Co.*

MYCOSTETIN.—785,653. *E. R. Squibb and Sons Ltd.*

MERCOTE.—798,879. *Merck and Co. Inc.*

SPRINT.—805,369. *D.D.D. Co. Ltd.*

ORALDENE.—806,028. *Warner-Lambert Pharmaceutical Co.*

NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery Lane, London, W.C.2.

Gordon Drake Ltd. 11.7.61. 161 High Street, Strood, Kent. Pharmaceutical and veterinary chemists. £100. Dirs.: Henry G. and Sheila D. F. Drake.

Willis (Chemist) Ltd. 12.7.61. 406 Bank Chambers, 329 High Holborn, London, W.C.1. £4,000. Dirs.: Clifford E. and Joan M. Willis.

Coopers (Ashington) Ltd. 14.7.61. 2 Myrtle Street, Ashington, Northumberland. Mfrs. and dls. in perfumes, cosmetics, shampoos, etc. £6,000. Dirs.: Robert Cooper, Cuthbert Stephenson and Robert E. Gray.

Wade's Chemists (Bermondsey) Ltd. 14.7.61. £100. Dirs.: Charles H. Scarborough and Kathleen B. Wilson, 26 Belmont Hall Court, London, S.E.13.

Collins (Norwich) Ltd. 14.7.61. 25 The Walk, Norwich. Pharmaceutical and genl. chemists and druggists. £9,000. Dirs.: Claude O. M., Frances C. and Michael F. M. Benton.

Agrodyn Ltd. 4.7.61. Piccadilly House, Piccadilly Circus, London, S.W.1. Producers of health restoring tonics, medicine foods, pharmaceutical chemical, etc. £100. Dirs.: Alexander Szoeczy and Nigel T. Bowyer.

E. C. Sleep (Cowplain) Ltd. 4.7.61. 231 London Road, Waterloo, Hants. Chemists, druggists. £1,000. Dirs.: Edward C. and Mrs. J. Sleep.

L. Croft and Co. Ltd. 5.7.61. 102 Southampton Street, Reading, Berks. Druggists, chemists, etc. £7,000. Dirs.: Miss Lilian Croft, John W. Webber.

M. D. Godfrey (Chemists) Ltd. 18.7.61. 44 Hamlet Court Road, Westcliff-on-Sea. £1,000. Dirs.: Myles D., Mrs. I. S. and R. M. Godfrey.

A. T. Honiatt and Sons Ltd. 18.7.61. 16 Wimpole Street, London, W.1. Consulting, analytical, mfrg. pharmaceutical and genl. chemists. £2,000. Dirs.: Isadore S. and Murray Gilbert.

Llanharan Pharmacy Ltd. 19.7.61. 3 The Square, Llanharan, W.I. 500. Dirs.: Daniel and W. J. Fisher.

P. Fielding (Chemist) Ltd. 20.7.61. 391 South Road, Sheffield 6. Chemists and druggists. £2,500. Dirs.: Patricia and Frank A. Fielding.

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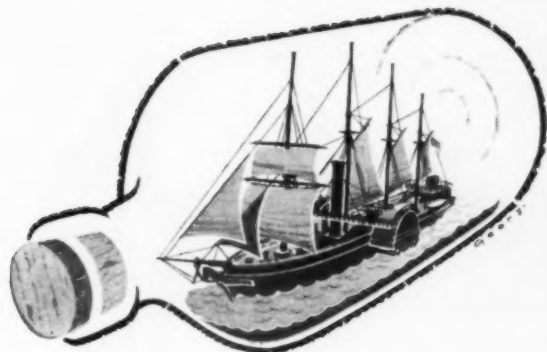
Sixty-Five Years Ago

From MANUFACTURING CHEMIST

September 1896

Diphtheria in London

A paper was read at the recent B.M.A. Congress at Carlisle by F. A. Dixey on "The Vital Statistics of Diphtheria in London," in which it was stated that comparing the average weekly returns of deaths for the previous five years, he found that after rising from 26.2 in 1891 to 36.2 in 1892 and 62.8 in 1893, they fell to 51.4 in 1894 and to 44.5 in 1895. This diminution, which seems still in progress, represents the savings of many hundreds of lives and leads the author to the confident conclusion that the diphtheria mortality of the metropolis has received a considerable check, "which it is difficult to attribute to any other cause than the introduction of serum treatment."



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AND MARCHON SURFACTANTS PLAY A BIG PART IN IT**

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Substituted Benzophenones with a high absorption in the ultra-violet. Designed for the protection of plastics and other materials sensitive to UV light.

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Gallic acid esters of dodecyl, octyl and propyl alcohol for the stabilization and prevention of rancidity in edible oils, fats and perfumes.

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(2 Hydroxy 1:4 Naphthaquinone)

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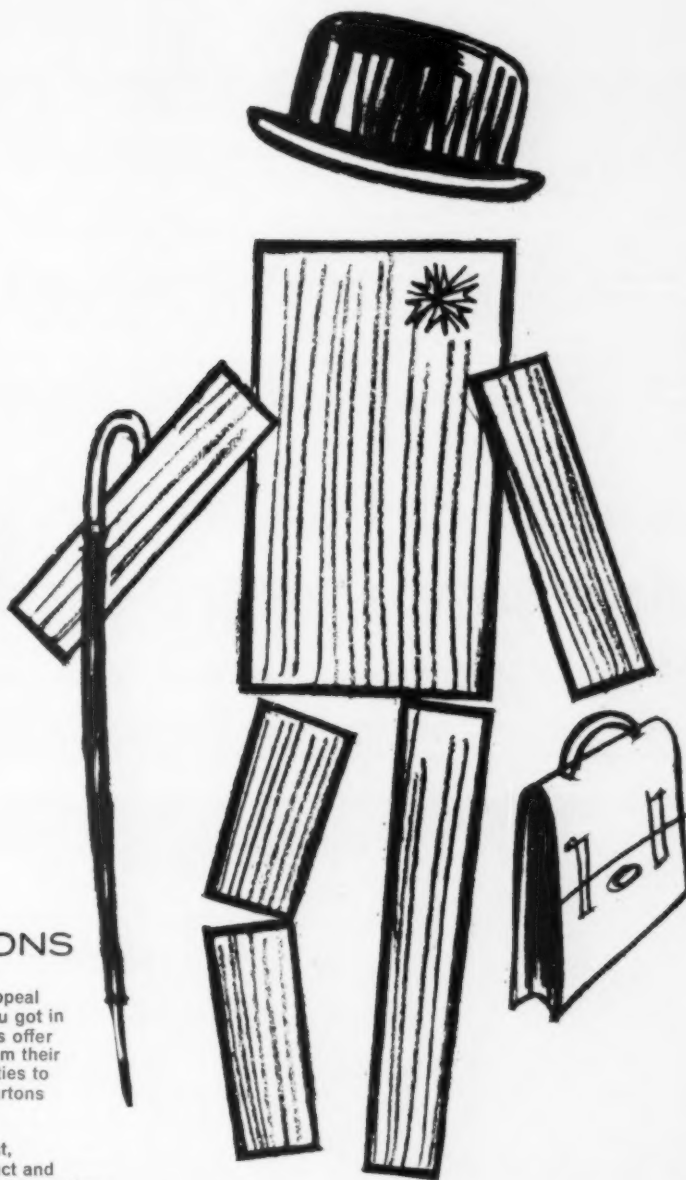
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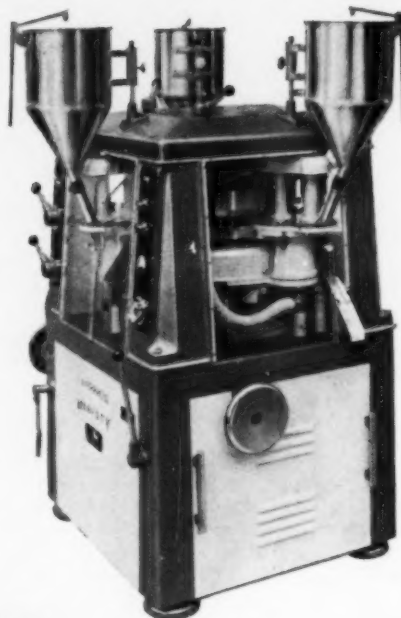
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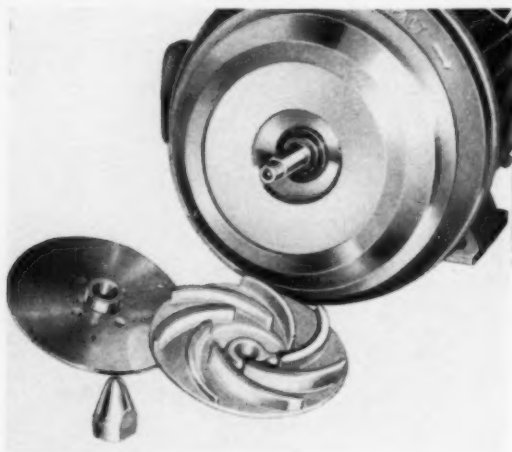


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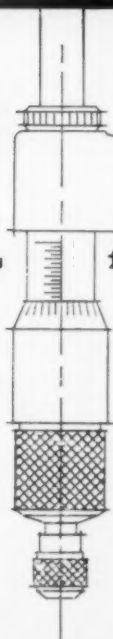
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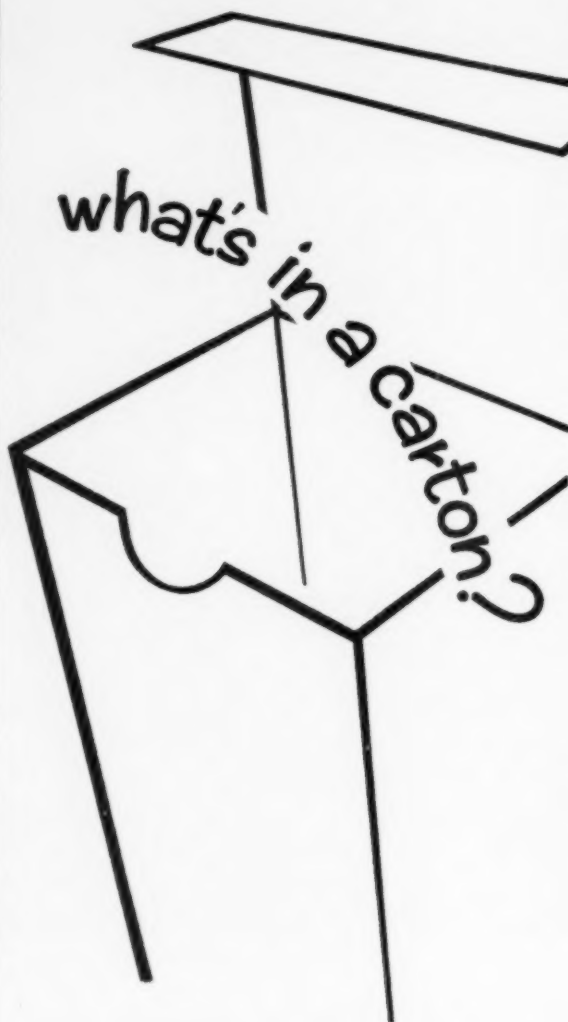
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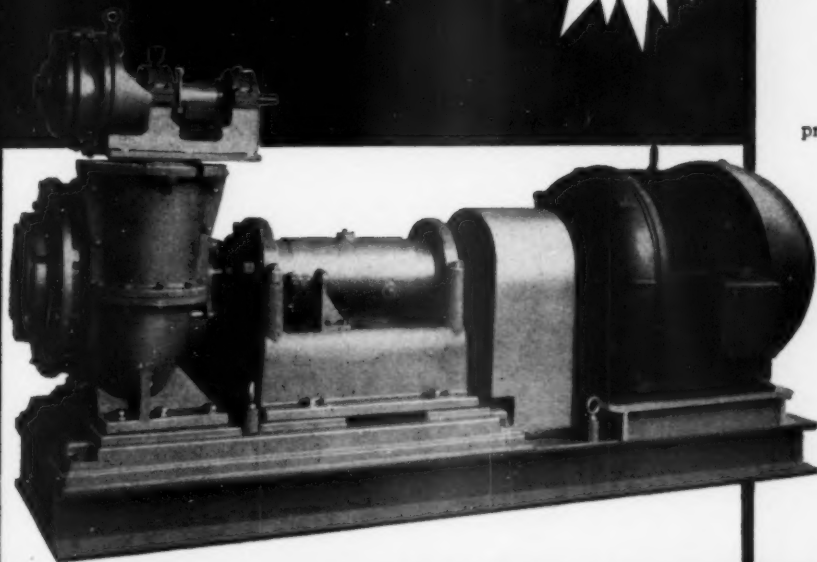


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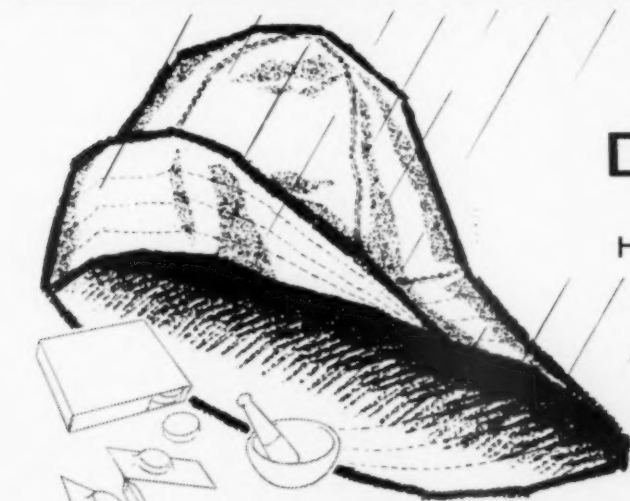
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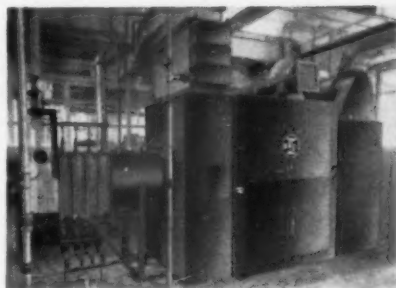
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
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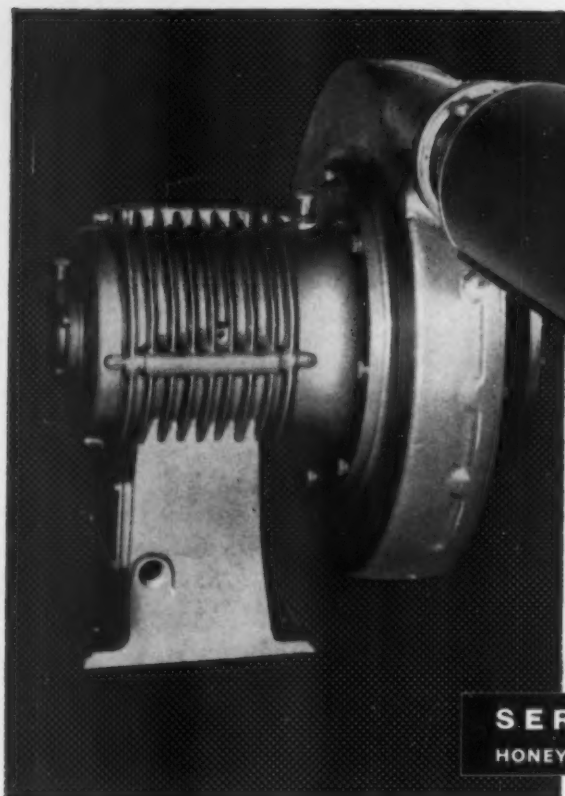
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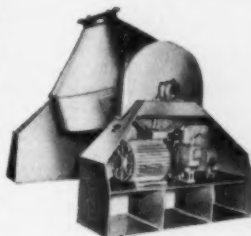
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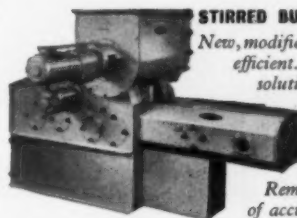
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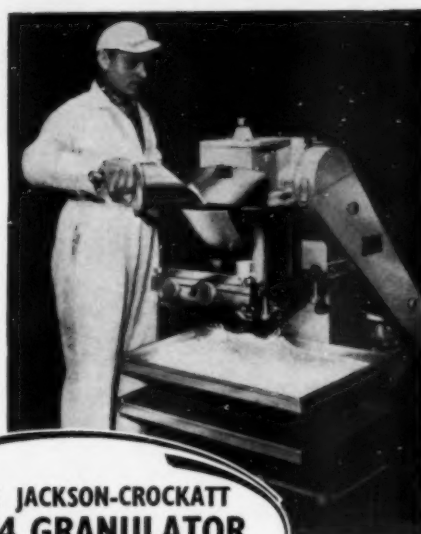
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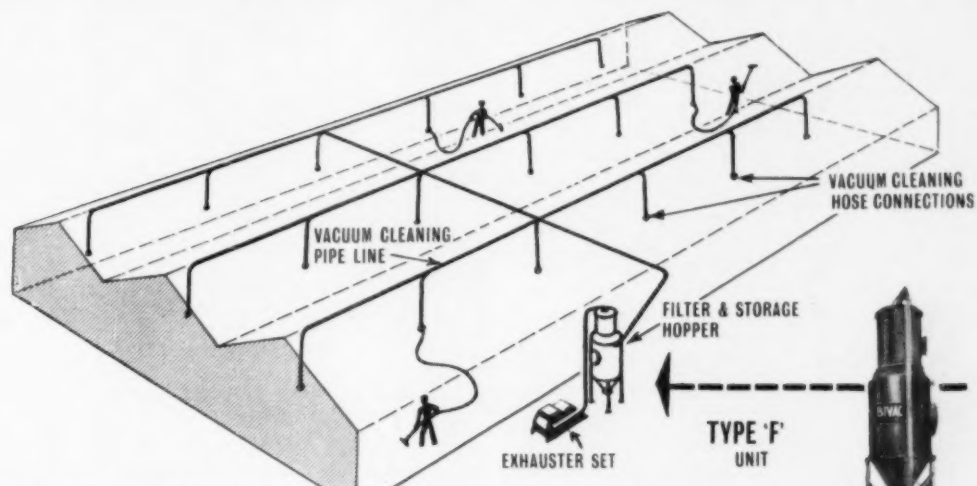


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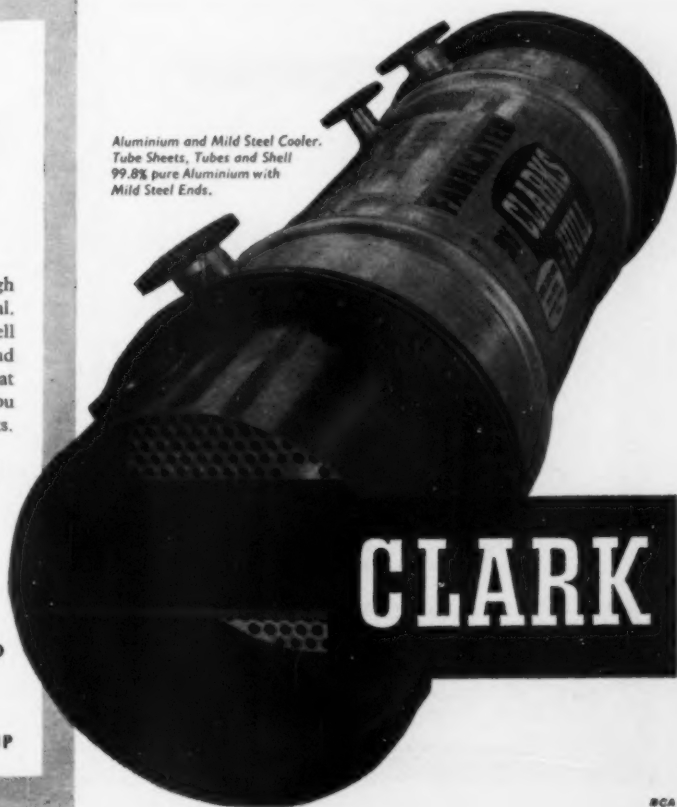
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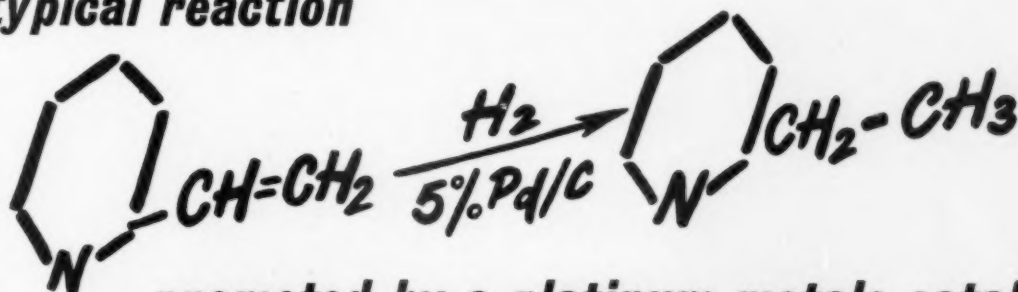


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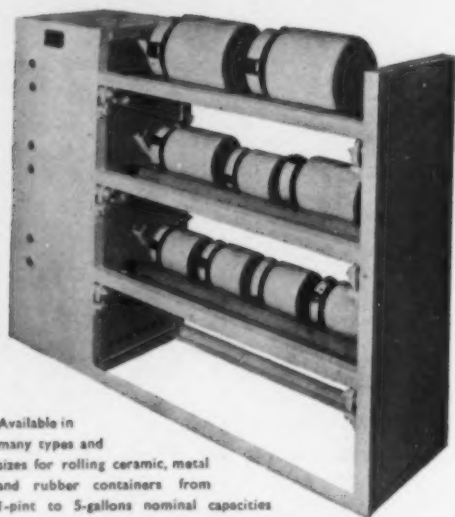
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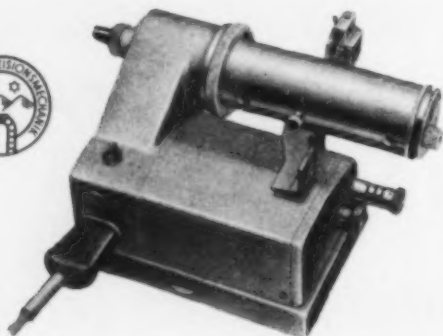


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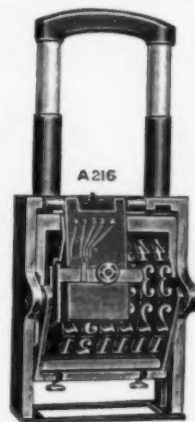
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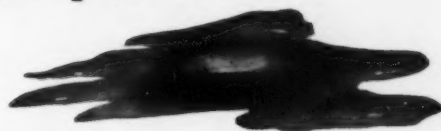
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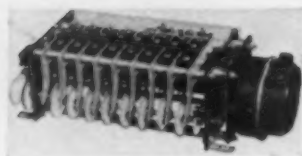
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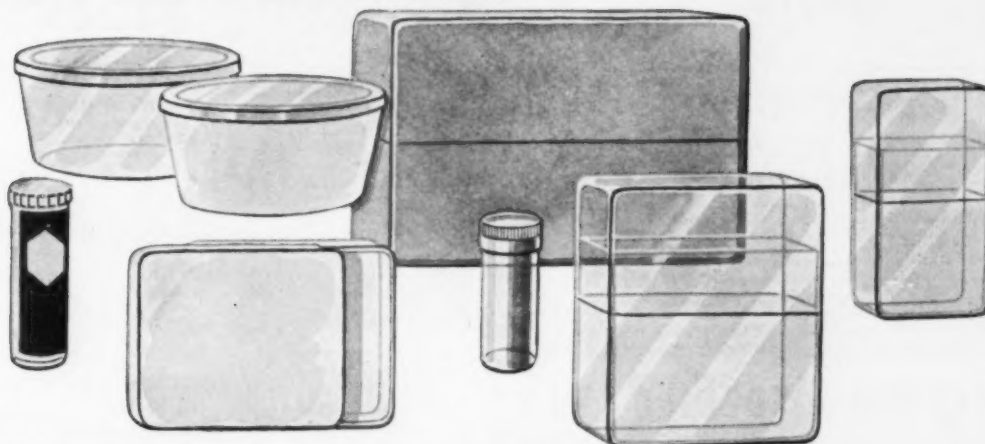
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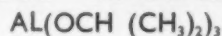
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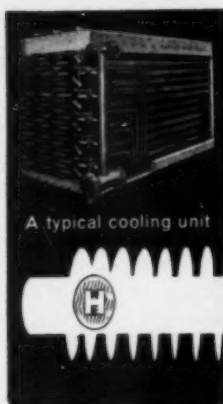
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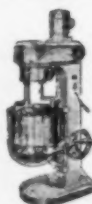
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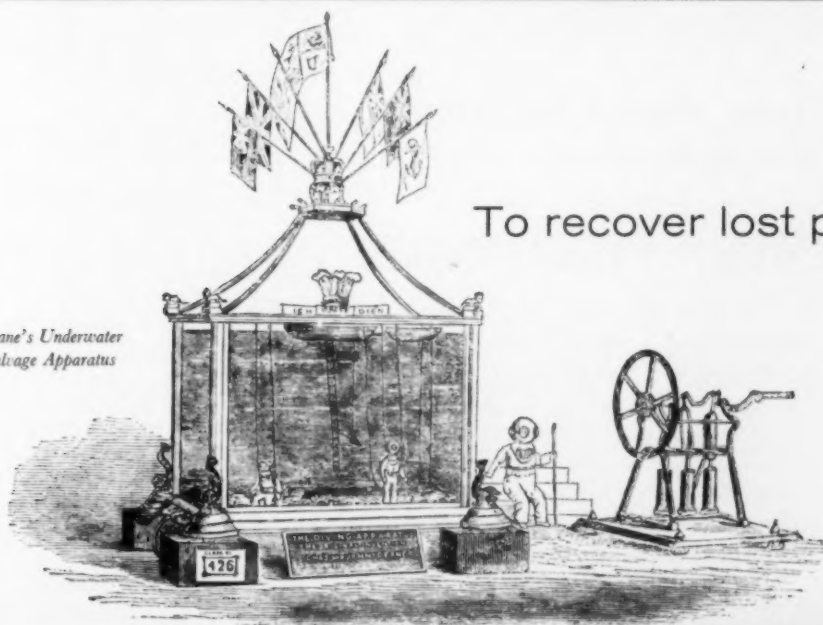
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COMPLETE Ball Mill Grinding Plant by *International Combustion*, comprising 8 ft. by 48 in. chrome steel-lined Hardinge Ball Mill driven by 220 h.p. motor with vertical feed hopper, constant weight belt feeder, 7 ft. diam. steely cyclone, 6 ft. 6 in. diam. double cone separator, motor driven fan, etc. Pulveriser by *Christy and Norris*, 24 in. by 24 in., heavy cast construction with renewable steel liner plates, heavy steel swing hammers, approx. 7 in. by 2 in. by 1 in. and rotor fitted ball/roller bearings, arranged with feed hood with vertical intake and hinged swing door.

7 ft. Edge Runner Mill by *Clayton Goodfellow*, cast iron tapered pan 9 in. deep at sides, twin tapered rollers average 37 in. diam. fitted scrapers and ploughs, no outlet, pulley drive, aluminium canopy with side covers. Two AVAILABLE.

6 ft. EDGE RUNNER Mill by *Coulthurst*, pan 12 in. deep with slide outlet. Positive drive to roll 42 in. diam. by 9½ in. face. Underdriven through gearing by 7½ h.p. 400/440/3/50 cycles motor with starter.

Vacuum Drying Plant by *Scott*, comprising horizontal, cylindrical agitated Drier, 23 ft. long by 4 ft. i.d. with top centre feed and bottom centre outlet with handwheel control, jacket and chamber pressures 10 p.s.i. Drive by 10 h.p. 400/3/50 cycles motor through gearbox. Steel feed hopper, electric vibration unit, belt and bucket elevator, overhead steel holding bin, etc.

TWIN-CYLINDER DRIER by *Simon*, 82 in. by 28 in., complete with gearbox, vee belt drive by 15 h.p. motor and starter, grinding knives and available spares.

Vacuum Oven by *Francis Shaw*, 6 ft. 3 in. high by 7 ft. 10 in. back to front by 5 ft. 1 in. wide internally, platens of welded construction and heavy swing door each end having four corner wheel operated swing clamps. Usual flanged connections to internal headers with swab neck connections to platens. SEVEN AVAILABLE—three 15 platen cast iron—two 12 platen cast iron—two 12 platen steel.

Oliver continuous Filter by *Dorr Oliver*, four rotating discs 6 ft. diam. with timber filter plates in copper trough, driven through worm gear by chain sprocket, with dry vacuum pump, centrifugal pump and filtrate and wash water receivers.

JACKETED FILTER PRESS by *S. H. Johnson*, serial KJ1, 31½ in. sq. with 38 chambers giving total working area of 475 sq. ft., working pressure inside chambers 60 p.s.i. max. Plates arranged for inside circulation of cooling brine, plates and frames are of gunmetal, frames 1½ in. thick, chamber 1½ in. deep. Fitted hand hydraulic tightening gear and complete with filter cloths. FIVE AVAILABLE.

(continued next col.)

PLANT AND MACHINERY FOR SALE

ROTOCELL ROTARY Vacuum Filter by *International Combustion*, drum 4 ft. 6 in. diam. by 18 in. face, cast iron construction with slotted copper filter plates. Mounted in plain bearings in mild steel trough, usual vacuum connections. Drive from 5 h.p. 400/3/50 cycles motor with starter.

VERTICAL mild steel water jacketed Turbine Mixer by *Dobson and Barlow*, Model No. 7, 6 ft. by 5 ft. 3 in. deep on straight, bolted on domed cover, flat bottom 4 ft. diam. impeller in bottom of vessel underdriven through glanded shaft and worm reduction gearbox from direct coupled 50 h.p. motor. Jacket suitable 40 p.s.i. water pressure, mounted on mild steel legs.

DOUBLE "Z" BLADE MIXER by *Werner Pfeiderer*, cast iron construction, trough approx. 52½ in. by 43½ in. by 34½ in. deep, double geared, arranged for flat belt drive, designed for hydraulic tilting but tilting gear not available, trough water jacketed.

Double Trough Tilting Mixer by *Melvin and Gillespie*, trough 21 in. by 21½ in. by 18 in. deep, twin "Z" blades fitted ring seals, hinged cover on mixer. Tilting through clutch and chain wheel to back screw. Drive by 4 h.p. 400/3/50 cycles motor. FIVE AVAILABLE.

UNUSED STAINLESS STEEL double effect Evaporator by *Bennett Sons and Shears*, comprising First effect Evaporator mild steel Calandria, approx. 9 ft. over stainless steel tubeplates with solid drawn stainless steel tubes approx. 1½ in. bore by 9 ft. long by 16 SWG. stainless steel Separator. Second effect Evaporator of similar construction to first effect. Stainless steel Separator body suitably stiffened to withstand 28 in. vacuum. First stage Milk Preheater, mild steel Calandria with stainless steel tubeplates and tubes, Second and Third stage Preheaters. Stainless steel holding tank and thermo-compressor. Designed to deal with 2,000 gal. per hour of milk at inlet temp. of 40°F, concentrating to 800 g.p.h.

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Ref. B.380. British. Male. Married. Age 35. B.Sc. (Forestry). 14 yrs. Forest Officer, forestry—govt. At present Personnel Officer—govt.—Ministry H.Q. Administration. Practical knowledge & keen interest in agriculture. Seeks FORESTRY OR PERSONNEL ADMINISTRATION WORK. U.K.—Scotland pref. £1,500 p.a. min.

Ref. B.382. Irish. Male. Married. Age 26. RESIDENT ENGLAND. B.Eng. 5½ yrs. Asst. Engr., consulting engrs. At present Asst. Engr., consulting (civil) engrs. Consid. exper. design & detail work on R.C. & genl. harbour & steam power station design & on site supervising con. construction bldgs., roads, railways & services. Seeks post as SITE ENGR., with civil engg. contractors. London. £1,250 p.a.

Ref. B.383. British. Male. Married. Age 38. Assoc. Inst. Science Technology. M.R.S. Health. 1 yr. Student Technician & 2 yrs. Junr. Technician, tropical medical research. 6 yrs. Senr. Technician & 5 yrs. Chief Technician, virological research. 10 yrs. Research Superintendent/Supt. Medical Research Technologist, tropical virus research. At present Superintendent Medical Research Technologist (Virology), tropical medical research. Consid. exper. design & devpt. research labs., prod. of medical films, qualified installation of medical refrigeration—high vacuum systems. Seeks post as CHIEF EXPERIMENTAL OFFICER/MEDICAL REPRESENTATIVE. S.W. England, London or abroad. £1,600 p.a. min.

Ref. B.386. British. Male. Married. Age 30. Resident Africa. B.Sc. (Agric.) Hons. 14 yrs. Agric. Officer & District Plant Protection Officer, Indian Govt. At present Agric. Officer i/c Expt. Sugarcane Estate, Africa—experimental experience on sugarcane, weedkillers, fertilisers, insects, pests & disease control. Seeks post as RESEARCH WORKER. U.K. or any Commonwealth country. £1,200 £1,500 p.a.

Ref. B.390. British. Male. Married. Age 59. Exper. includes 7 yrs. Inspector, telecommunications. 10 yrs. self-employed, radio. 3 yrs. Inspector, acoustic engg. 20 yrs. Head of Eng. Laboratory, telecommunications. At present Head of Eng. Lab., London (chem. engg.), telecommunications. Seeks post in TELECOMMUNICATIONS ENGG. London (S. or S.E. pref.). £1,000 p.a.

Ref. B.391. British. Male. Married. Age 35. O.N.C. (Mech. Eng.). 6 yrs. Experimental Work (incldg. fitting & toolmaking), mnfr. of aircraft ejector seats. At present Assistant Engr., research (mainly in nuclear field). Exper. design & devpt.

work on experimental test rigs for nuclear applications. Seeks post as ENGINEER/TECHNICAL ASSISTANT. London or Gerrards Cross area. £1,000 p.a. min.

Ref. B.396. British. Male. Married. Age 26. B.Sc. (Zoology). At present Editor of scientific journal. Seeks post pref. as PLANT NEMATOLOGIST, but would consider post dealing with pest control or parasitology. Anywhere considered. £900 p.a.

Ref. B.398. British. Male. Married. Age 41. C. & G. Inter. m/c shop theory & practice. M. Soc. Instrument Technology. 7 yrs. D/man, electro-mech. components. 3 yrs. Design D/man, aircraft test rigs. 2 yrs. Design D/man, aircraft actuators. 1 yr. Design D/man, electro-mech. instruments. 5 yrs. Design D/man, Section Leader, aircraft navigational instruments. 6 yrs. Chief D/man, electro-mech. instruments. At present Project Design Engr. (Mech.), electro-mech. instruments. Accredited patents. Can produce isometric sketches or dwgs. Knowledge of mouldings & has devised coding systems for prod. use. Seeks post as DESIGN ENGR. (MECH.). 10 mile radius of Hayes, Middx. £1,200 p.a.

Ref. B.400. British. Male. Married. Age 44. Inter. B.Sc. 3 yrs. Lab. Asst. & 2 yrs. Chemist, cellulose & synthetics dept., paint mnfrs. 2 yrs. Chemist, plastics mnfr. 3 yrs. Foundry Analysis Chemist, motor vehicle mnfrs. 3 yrs. Chemist, printing ink mnfrs. 1 yr. Chemist/Works Manager, lacquer mnfrs. At present Chemist/Asst. Works Manager Cellulose Dept. Manager, french polish, cellulose lacquer & varnish mnfrs. Author of published Technical articles. Seeks post as CHEMIST/WORKS OR PROD. MANAGER. S. London area. £1,200/£1,500 p.a.

Ref. B.402. British. Male. Married. Age 42. Age 42. Nat. Inst. Eng. Dip. 16 yrs. Air Engr., R.A.F. 4 yrs. Workshop Instructor, steam turbine mnfr. At present Examiner i/c Aeronautical Inspection, aeronautical engg. Seeks SUPERVISORY (ENGG.) POST. N. England. £18 per week.

Ref. B.403. British. Male. Married. Age 42. Dip. in Agric. M.I.C.A.M. Exper. includes 6 yrs. Tenant Farmer, 4 yrs. Area Manager, seedsman, & 3 yrs. Fertiliser Adviser, fertiliser mnfr. At present Fertiliser Adviser, fertiliser mnfr. Freelance agric feature writer & broadcaster. Wide exper. organising agric. demonstrations & meetings. Seeks post as ADVISORY SERVICES MANAGER (SEEDS, FERTILISERS). U.K.—pref. S. England, but would consider abroad. U.K. salary £1,500 p.a.

Ref. B.404. British. Male. Married. Age 27. H.N.C. (Mech. Eng.). 6 yrs. Apprentice/Junr. D/man, special purpose m/cs, packaging. 6 months. D/man, electro-mech. devices. 3 yrs. Design D/man, plant devpt. At present Design D/man, electrode mnfr., arc welding, m/cs & accessories. Seeks post as JUNR. ENGR./SALES ENGR. City or N. London. £1,000 p.a.

Ref. B.406. British. Male. Married. Age 41. B.Sc. (Mining). 1st Class Colliery Manager's Cert., N.A.C.M. 6 yrs. Colliery Manager & 3 yrs. Colliery Agent. At present Mines Superintendent—coal, iron, manganese limestone, abroad. Exper. controlling isolated stations & of water supply, hospitals, housing. Seeks post as ENGG. ADMINISTRATOR/MINE SUPT. U.K. or abroad—not Africa.

Ref. B.407. British. Male. Single. Age 33. B.Sc. (Chem.). Dip. Chem. Eng., Grad. M.I. Chem.E. 2 yrs. Petroleum Technician, 2 yrs. Devpt. Chemist, oil company. At present Chemist/Chem. Engr., fine chemicals mnfrs. Exper. prod. of antibiotics, steroids & other organics & of work on plant/process design & commissioning of plant. Seeks post as TECHNICAL EXECUTIVE IN PROD., DEVPT., OR TECHNICAL SERVICE. U.K.—Provinces pref. but London considered. £1,600 p.a.

Ref. B.409. British. Male. Married. Age 30. Apprenticeship & 3½ yrs. practical toolroom exper. At present Prod. & Tool Devpt. Engr., motor vehicle mnfrs. Exper. of marine engg. Seeks post as TECHNICAL REPRESENTATIVE. U.K. £1,000 p.a.

Ref. B.411. British. Male. Married. Age 40. 2 yrs. Trainee, inter. communications. 4 yrs. Export Manager, silk mnfr. At present Installation Planning Engr., electronics—radar, radio, TV, transmitters, land/marine communications equip. Exper. customer liaison, collation of information. Seeks TECHNICAL SALES/CUSTOMER LIAISON/SALES ADMIN. OR PROMOTION POST. Europe. London, S. England, or S. America. £1,300 p.a.

Ref. B.412. British. Male. Married. Age 27. Studying for O.N.C. 5 yrs. Apprentice, motor engrs. 1½ yrs. Bench Fitter, motor mnfrs. At present Junr. Design D/man, automotive & special purpose m/c work, design & devpt. engrs. Seeks post as TECHNICAL REPRESENTATIVE, based on Luton area.

Ref. B.474. British. Male. Married. Age 26. O.N.C. Mech. Eng. with Prod. endorsements. 1st yr. H.N.C., C. & G. M/c Shop Engg. Genl

(continued overleaf)

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Works Apprenticeship, followed by training & work in Plastics R. & D., & metal finishing research with special ref. to plating & effluent plant layout & design. At present Pilot Plant Supervisor, light engs. Seeks **TECH. SERVICES/LIAISON/TECH. REP. POST.** Herts/Middx. pref. but will consider elsewhere. £1,000 p.a. min.

Ref. B.475. British. Male. Married. Age 25. H.N.C. Mech. Eng. G.I. Mech. E., G.I. Prod.E., S.I. Elec. Eng. 7 yrs. Student Apprenticeship, motor car/truck mnfrs. At present Prod. Planning Engr., motor car/truck mnfrs. Seeks post as **PROD. ENGR.—PLANNING OR MANAGEMENT.** S.W. England, India, Chile, Argentina or U.S.A. £1,200 p.a.

Ref. B.476. British. Male. Married. Age 40. 2 yrs. D/man, guided missiles. 2 yrs. D/man, navigation instruments. 6 yrs. D/man, contract dwg. At present Senr. D/man, electronic & microwave instruments. Seeks **ACTIVE & RESPONSIBLE POST—NOT DWG. OFFICES—interested Rep./Liaison work.** £1,000 p.a. min.

Ref. B.478. American. Male. Married. Age 42. **RESIDENT U.K. A.M.I.E.E. (U.S.A.), 2nd Class P.M.G. Telegraphy Cert.** 6 yrs. Operator, radio communications. 2 yrs. Elec. Motor Tester, elec. motor mnfr. 1 yr. i/c Eng. Laboratory. 2 yrs. Chief Inspector, 1 yr. Chief Quality Control. 4 yrs. Asst. Chief Engr., elect. motor mnfr., U.S.A. Good knowledge all phases of mass prod. Seeks **INSPECTION POST.** London.

Ref. B.481. British. Male. Married. Age 35. At present Electronic Foreman, nucleonics. Several yrs. exper. short prod. runs prototype, devpt. & exper. work, incldg. transistor units. Seeks post as **FOREMAN OR ABOVE.** London. £1,100 p.a.

Ref. B.483. British. Male. Married. Age 41. B.Sc. (1st Class Hons.) Chem., M.Soc. Inst. Technology. Taken courses in W.S. & Management. 3 yrs. Asst. Research Chemist. 4 yrs. Plant Manager, 3 yrs. Inst. Devpt., & 2 yrs. Works Instrument Manager, chem. mnfrs. 1 yr. Chem. Plant Manager, abroad. At present Chem. Plant Manager, chem. mnfrs. Languages: German, French & Italian. Seeks **CHEMICAL PLANT OR WORKS MANAGEMENT POST.** U.K. £2,750 p.a.

Ref. B.484. British. Male. Single. Age 24. G. & G. B. & C. Finals Instlin. 6 yrs. Indentured Apprentice. 1½ yrs. Elec. Instructor, Army. At present Electrician, elec. contracting & supply. Exper. all types instlin. & wiring systems—industrial, commercial & domestic incldg. automatic control of heating systems. P.F. Correction & Elec. m/c.s. Supervisory exper. Seeks post as **ASST. INSTLIN. ENGR.** London or Essex. £800 p.a.

Ref. B.488. British. Male. Married. Age 42. O.N.C. (Eng.). 5 yrs. Pupil Engr.—workshop training, commercial vehicles. 1 yr. Junr. D/man, preselective self charge gear boxes. 5½ yrs. Design D/man, private & commercial vehicles. 1½ yrs. Checker & 1 yr. Design D/man, aero engines. 1 yr. i/c D.O., industrial diesel engines. 2 yrs. Senr. Designer, buses & commercial vehicles. At present Chief D/man, commercial vehicle mnfr. Exper. control shop labour, fitters, chargehands & clerical staff. Seeks **SALES ENGR. OR STAFF MANAGEMENT POST.** London or S. England. £1,500 p.a. min.

Ref. B.489. British. Male. Single. Age 21. G.C.E. "A" level Physics & Chem. At present Student & now taking exams. for Assoc. of Nat. College of Rubber Technology & Assoc. of Inst. of Rubber Industry. Seeks **EXPORT/TECH. SALES OR SERVICE/RUBBER TECHNOLOGIST POST.** London, S. England or abroad. £800 p.a.

Ref. B.494. British. Male. Married. Age 22. S2 Standard Nat. Cert. Course (Mech. Eng.) & now studying for external degree. 3 yrs. Apprentice Toolmaker, & exper. in D.O., laboratory & prod. office. At present Asst. Dept. Manager, reinforced plastics, thermoplastic & thermosetting plastics. Good knowledge glass fabrics & thermosetting resins. Seeks **MANAGEMENT POST—pref. reinforced plastics.** London, Home Counties or S. England. £750 p.a.

Ref. B.495. British. Male. Single. Age 22. Agric. Engg. Dip., C. & G. (Agric. mech.). 9 months. Service Engr., agric. engr. At present engaged in genl. fitting & testing, agric. engs. mnfrs. Seeks **TECHNICAL POST** in Agric. Engg. U.K. £18 per week.

Ref. B.497. British. Male. Single. Age 56. B.Sc., A.M.B.S.I.R.A. 5 yrs. Design Engr., oil & chem. plants. 5 yrs. Site Engr., nuclear plant. 5 yrs. Instrument Engr. & Piping Engr., steam plant. 2 yrs. Design Engr., steelworks plant. 2 yrs. Design Engr., heavy press & rolling mills. At present Instrument Engr., consulting engs. to oil, chem. & nuclear industries. Knowledge steel & RC structures. Aircraft & marine design exper. Seeks post as **SITE OR DESIGN ENGR.**, anywhere. £1,500 p.a. min.

Ref. B.498. British. Male. Married. Age 32. B.Sc.(Chem.), D.I.C., A.M.I.Chem.E. 4 yrs. Lab. Asst., leather & paint works. 5 yrs. Lab. Asst. & 2 yrs. Chief Chemist, electricity power station. 1 yr. Chem. Engr., flue gas washing & effluent treatment. 3 yrs. Chem. Engr., fine chemicals. Wide exper. water treatment. Seeks post as **CHEMIST/CHEM. ENGR.**, pref. in Devpt./Pilot Plant field. U.K. £1,500 p.a.

Ref. B.499. British. Male. Single. Age 21. H.N.C. Chem. College Cert. in Mech. Eng. 4 yrs. Chemist, chem. mnfr. At present Chief Devpt. Chemist, mnfrs. specialised rubber & plastic materials, responsible for formulation of new materials & initial supervision of plant. Exper. process control. Seeks post as **ASST. OR TRAINEE PROD. MANAGER.** Pref. U.S.A., but elsewhere considered. £850 p.a. min.

Ref. B.500. British. Male. Married. Age 26. Pharmaceutical Chemist Dip. of Pharm. Soc. of G.B., Ph.C. 2 yrs. Apprentice, multiple chemist. 6 mnths. Manager, private pharmacy. 2 yrs. Dispenser, Army. 9 months. Relief Manager, multiple chemists. At present Manager of Retail Pharmacy, for wholesale & retail multiple firm. Seeks post in the more scientific aspects of Pharmacy, especially **PHARMACOLOGY PHARMACEUTICAL CHEM. OR PHARMACEUTICS—**not retail or representation. London or Surrey. £1,100 p.a. approx.

Ref. B.501. British. Male. Single. Age 24. Apprenticeship with process control inst. mnfr. At present Tech. Sales Engr., process control inst. mnfr. Good knowledge instruments & their applications. Seeks post as **INSTRUMENT ENGR. OR SALES ENGR.** £1,000 p.a.

Ref. B.502. British. Male. Married. Age 32. O.N.C. Mech. 4½ yrs. Apprentice, electro-mech. engs. 5 yrs. D/man, electronic engs. 2 yrs. D/man, camera & studio engs. 5 yrs. Designer, electronic engs. At present Asst. Chief D/man, radio & TV mnfrs. Seeks post as **CHIEF D/MAN, SECTION LEADER OR TECH. REPRESENTATIVE.** W. London or Maidenhead/Slough area. £1,350 p.a. approx.

Ref. B.503. British. Male. Married. Age 38. 4 yrs. Engg. training, radio & m/c tools. 6 yrs. Instrument Maker, clock mnfrs. 13 yrs. Asst. Foreman (devpt. shop), meter mnfrs. At present Project Engr. (sales dept.), instrumentation & controls for power plant equip. Seeks post as **REPRESENTATIVE.** Bognor Regis area.

Ref. B.504. British. Male. Single. Age 26. O.N.C. & H.N.C. Mech. & endorsements. G.I. Mech.E., Grad.I.E.D. 5 yrs. Apprentice, incldg. 2 yrs. in D.O., & 3½ yrs. D/man, designers & mnfrs. specialised aircraft equip. At present Mech. Design Engr., mnfr. magnetic tape & specialised tape recording equip. Seeks post with good prospects, pref. **DESIGN OR TECHNICAL REPRESENTATION.** Bucks. area pref., but elsewhere considered. £1,200 p.a.

Ref. B.505. British. Male. Married. Age 49. Chartered Secretary, Justice of the Peace. Consider. exper. all aspects Management, Sales, Purchasing, Accountancy. As Deputy of city corporation housing committee gained exper. contract work in many industries. Seeks **EXECUTIVE OR SALES** post. £1,200 p.a. min.

Ref. B.508. British. Male. Married. Age 29. A.C.E. 1st Class. Nat. Cert. Elect. 1 yr. Devpt. Engr., electronic engs. 2½ yrs. Senr. Design Engr. nucleonic engs. At present Senr. Design Electronic Engr., nucleonic equip. mnfr. Seeks post as **ELECTRONIC ENGR.** N. Rhodesia. £1,500 p.a.

Ref. B.509. British. Male. Married. Age 49. A.M.I. Plant E. 12 yrs. Chief Engr., 2 yrs. Superintending Engr., 2 yrs. Genl. Manager & 1 yr. Advisory Engr., managing agents of industrial concerns abroad. Consider. exper. sugar & chem. industries, erection, commissioning & running of plant & mnfr. of sugar m/cy. Seeks post as **ENGR. OR MANAGER (EXECUTIVE).** London. £2,500 p.a. min.

Ref. B.511. British. Male. Married. Age 38. Cert. & Diploma in Salesmanship. 10 yrs. Salesman, elec. supply industry. 1½ yrs. Sales Representative, elec. appliance mnfr. At present i/c Sales Office, elec. component mnfr. Seeks post as **SALES REPRESENTATIVE (ELEC.).** N. Kent area. £1,000 p.a.

Ref. B.514. Australian. Male. Single. Age 49. **RESIDENT U.K. Dipl. Engr. (Civil).** A.M.I.E. (Australia). 6½ yrs. Senr. Engr., harbour design & construction. 1½ yrs. Engr., railway bridge design & erection. 1 yr. Engr., factory & jetty design. 1 yr. Engr., power station design. 3 yrs. Engr., industrial buildings design. Seeks post as **CIVIL ENGR.** U.K.—London pref., but provinces or abroad considered. £1,400 p.a. approx.

Ref. B.515. British. Male. Married. Age 38. O.N.C. & H.N.C. Mech., H.N.C. Prod. E.C. & G. 1st Class M/c Shop, A.M.I.C.E., A.M.I.Mech.E., M.I.Prod.E., M.I.W.S., A.M.I.W., A.M.I. Plant E., A.M.Min.E. 4 yrs. Prod. Manager, engs. 4 yrs.

Maintenance Engr., mech. & civil projects. 4 yrs. Asst. Chief D/man, chem. plant mnfrs. 1 yr. Senr. Engr., devpt. division, mech. engs. 8 yrs. Asst. Tech. Director, consultants. At present Senr. Engr., engine mnfrs. Seeks post as **ASST. CHIEF OR CHIEF ENGR./PROD. ENGR./MECH. ENGR./WORKS MANAGER.** England. £1,780/£2,250 p.a.

Ref. B.517. British. Male. Married. Age 23. Inter. C. & G. Workshop Engr., O.N.C. & H.N.C. Mech. Eng., S.I. Mech.E. 6 yrs. Apprenticeship & at present D/man, motor cars. Seeks post as **TEST ENGR., OR SIMILAR.** U.K.—not London. £950 p.a.

Ref. B.518. British. Male. Married. Age 37. 9 yrs. Buyer, lampshade mnfrs. 3 yrs. Asst. to Man. Dir., printers. At present indust. buyer, mnfrs. Exper. in many markets for raw materials. Seeks post as **INDUSTL. BUYER.** U.K. £1,100 p.a.

Ref. B.519. British. Male. Married. Age 35. H.N.C. Mech. 3½ yrs. Pupil in toolroom & D.O., precision engs. 1 yr. Junr. D/man, textile m/cy mnfrs. 5 yrs. Tool & Plant D/man, heavy engs. 1 yr. Designer D/man, consulting engs. At present Asst. Plant Engr., medium/heavy engs. Exper. purchasing engg. equip. & control of labour. Seeks **TECH. SALES OR ADMIN. POST IN PLANT ENGG.** U.K.—provinces pref. £1,100 p.a. min.

Ref. B.522. British. Male. Single. Age 32. B.Eng. (Mech.), Indian University. Dip. Management Studies. A.M.I.Prod.E., Grad.I.Mech.E. 2 yrs. Graduate Apprentice, & 6 mnths. Engr., power plant mnfrs. 6 mnths. Senr. Designer of automation equip. & 2½ yrs. Senr. Designer of press tools, automobile mnfrs. 1½ yrs. Methods Engr., automobile accessories. At present Senr. Prod. Engr., camera mnfrs. Exper. costs & budgetary control. Seeks post as **PROD. ENGR. OR MANAGER.** U.K. or Canada. £1,350 p.a.

Ref. B.523. British. Male. Married. Age 25. Studying for O.N.C. 2 yrs. Lab. Asst., road materials laboratory. 2 yrs. Lab. Asst., asphalt & mastic mnfrs. 1 yr. Control Chemist, asphalt & macadam mnfrs. 1½ yrs. Lab. Asst., new town authority. At present Senr. Lab. Asst. (road & bldg. materials), civil & mech. engs. Consider. exper. testing all types bituminous road surfacings, concrete, bldg. materials, tars & of soil mechanics. Seeks post as **SENR. LAB. ASST.** U.K. £850 p.a.

Ref. B.524. British. Male. Single. Age 23. Cert. in Journalism. 1 yr. Mech. Engg. Apprentice, motor car mnfr. At present Journalist, newspaper publisher. Seeks **PUBLIC RELATIONS POST.** N. Home Counties. £15 per week min.

Ref. B.526. British. Male. Married. Age 39. 1st & 2nd yr. O.N.C. Mech. 4 yrs. M/c Setter, precision toolmakers. 11 yrs. Design Engr., instrument engs. 6 yrs. Section Leader & Asst. Chief D/man, electronic engs. 2 yrs. Section Leader, electronic engs. At present Designer, control systems & instrument engs. Seeks post as **TECH. SALES/PROJECT/LIAISON ENGR.** Berkshire area. £1,200 p.a. approx.

Ref. B.528. British. Male. Married. Age 29. R.N. Apprenticeship. Qualified I.C.E.s & Refrigeration. 12 yrs. R.N. & at present C.P.O., retiring September. Consider. exper. operation & maintenance of turbo & recip. m/cy, I.C.E.s & refriger. Seeks post as **SERVICING/MAINTENANCE/REFRIG. ENGR.** S. England pref., but anywhere considered. £900-£1,000 p.a.

Ref. B.529. British. Male. Married. Age 35. Govt. Training Course (Draughting). 6 mnths. D/man, electric appliance mnfr. At present Senr. Aircraft D/man, aircraft mnfr. Good exper. hydraulics, engine instlin., fire protection & structure, i.c. engines, motor vehicles, industrial electrics. Seeks post as **TECH. REPRESENTATIVE.** N. England—Yorkshire pref. £1,000 p.a.

Ref. B.530. British. Male. Married. Age 25. 3½ yrs. Plumber's Mate, sanitary engr. 2½ yrs. Plumber, bldrs. At present Plumber, maintenance for new town. Knowledge most bldg. trades, & their tools & materials. Seeks post as **BUILDER'S REPRESENTATIVE.** U.K.—not London.

Ref. B.531. British. Male. Single. Age 27. H.N.C. Applied Physics. Studying for Grad.Inst.Physics. 3 yrs. Lab. Asst., chem. research. 4½ yrs. Lab. Technician/Asst. Physicist, radio valve mnfr. At present Asst. Physicist, mnfr. electronic valves & devices. Seeks **TECHNICAL/SUPERVISORY** post. Anywhere. £1,100 p.a.

Ref. B.532. British. Male. Married. Age 28. Studying for Lic. of Inst. of Metallurgists. 3 yrs. Metal Finishing Section Leader, metallurgical laboratories. At present Asst. to Chief Metal Finishing Chemist, mnfrs. Exper. formulation of new processes, investigation of new processes, plant layout, design & instlin., effluent treatment, costing, electro-plating, metallography & metallurgical analysis. Seeks post as **METAL FINISHING CHEMIST/METALLURGIST** or similar. U.K. £1,200 p.a. min.



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